THE
ELECTRICAL REVIEW.

VOL. LXIV. MAY 28, 1909. No. 1,644.

ELECTRICAL REVIEW.

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THE ELECTRICAL INDUSTRY AND THE "DAILY EXPRESS."

WORK FOR OVER 74,000 HANDS!

THE *Daily Express* has been holding what it is pleased to call an inquiry into the bearing of Tariff Reform upon the electrical industry. Seeing that the *Express* took a leading part in engineering the "Tariff Commission," it might have been supposed that any further inquiry on its part was a work of supererogation. But, it will be remembered, the "Commissioners" did not recommend any duty on electrical goods, nor on the goods used in electrical engineering, as the evidence showed only too plainly the folly of so doing. Hence, the *Express* is disappointed, and holds an "inquiry" on its own account, in order to, if possible, put a different complexion on the matter. And it has, with a vengeance! In bold headlines we read—

Striking Figures.

More Work for over 74,000 Hands.

Extra Hands 74,000.

Extra Weekly Wages £119,600.

The *Express* sent out to electrical firms 188 inquiry forms, asking how many extra hands they could employ, and what extra wages they could pay, if the Government imposed an *ad valorem* duty of 10 per cent. on all manufactured goods and parts in their lines of manufacture. Some of the firms (fairly representative firms, too) replied, "We should not expect our trade to increase under the influence of a duty;" "We do not believe a 10 per cent. duty would increase our trade;" "Do not trouble us with Protection, spend your money on the genuine unemployed;" "We need no Protection," and so on. A little over half the number—viz., 48—replied that a 10 per cent. duty would be a good thing, but *only* 18 gave precise estimates of the increased number of hands they could employ and the extra weekly wages they could pay, and on these figures the *Express* builds a wonderful castle in the air.

It is really marvellous what the *Express* can do with a few figures when it really gives its mind to it. First of all, it gives some figures of imports and exports. We say "some figures," because it does not give them all, but only such as to suit its immediate purpose. "The increasingly-serious position," it says, "of the British manufacturer is shown in the fact that, while the imports of electrical goods and apparatus (other than machinery and telegraph and telephone wire) are steadily expanding, the exports are no less steadily diminishing." The following figures are then given, which, so far as they go, are correct:—

	Imports.	*Exports.*
1903	£876,000	£2,486,000
1907	1,247,650	2,469,927
1908	1,263,757	1,942,106

Now, why did not the *Express* publish the corresponding figures for electrical machinery, seeing that practically every firm whose name is given is interested in this branch of the industry. The answer is simple. It would have disproved the case, for which a suppression of the truth was essential. After having deliberately created the impression that the imports were steadly expanding, and the exports no less steadly diminishing, the *Express* gives the figures referring to machinery for 1907 only. These are—

	Imports.	*Exports.*
1907	£603,218	£995,709

It does not set the figures out like this, but just mentions them in a casual sort of way. It will be seen that the exports of electrical machinery exceed the imports *by over 50 per cent.* But let us supply the figures which the *Express* is afraid to give, and we quote these from the report of its own child, the "Tariff Commission" :—

IMPORTS AND EXPORTS OF ELECTRICAL MACHINERY.

	Imports.	*Exports.*
1903 ...	£555,000 ...	£437,000
1904 ...	559,000 ...	523,000
1905 ...	497,000 ...	644,000
1906 ...	571,000 ...	842,000
1907 ...	603,000 ...	996,000

Where do we see "imports steadily increasing and exports as steadily decreasing?" The imports of electrical machinery, notwithstanding the steadily decreasing demand, have been *practically stationary*, whilst the *exports have more than doubled*, those to *foreign* countries having *almost quadrupled*, and if we except Japan and the Argentine, the foreign exports have *more than quintupled* in four years! Well might the *Express* suppress these figures.

And this is what is called conducting an inquiry! But the skill of the *Express* in stating facts is as nothing compared to its dexterity in the manipulation of figures. It makes them talk. Eighteen manufacturers tell the *Express* that a 10 per cent. tariff will enable them to employ 2,910 extra hands and pay an extra £4,696 per week in wages, and these figures are displayed in heavy type. Now comes the great figure-juggling feat, and Cinquevalli must really look to his laurels. We must quote the exact words lest we lose the beautiful simplicity of the method: "The eighteen firms who give figures form 23 per cent. of the total number who replied. Approximately, it is said, there are 2,000 firms engaged in the manufacture of electrical apparatus, fittings and machinery. If only 23 per cent. of these could provide increased employment and wages in the same proportion as the firms who give figures, the totals would be :—

ESTIMATED FOR WHOLE TRADE.

Extra hands	74,060
Extra weekly wages ...	£119,600."

The Tariff Reform movement must indeed be in a very parlous state if it is reduced to such methods as these. There are 2,000 firms engaged in the trade, so the *Express* sends out inquiry forms to 188 of them in order to prepare its brief! Seventy-eight firms reply, of whom 48 are favourable. This represents 2·4 per cent. of the whole trade. Eighteen firms give figures, and these, as the *Express* puts it, form 23 per cent. of those who replied. How like the *Express!* Why did it not at least say that it represented *only* 10 *per cent.* of the firms to whom inquiry forms were actually sent?

Fancy basing such stupendous figures on the opinions of even 10 per cent. of the trade. But what of the remainder of the 2,000, whose opinions were never asked? The 18 firms who replied form *less than 1 per cent.* of the number who the *Express* says are engaged in the electrical manufacturing industry; yet the replies of less than 1 per cent. are sufficient upon which to base estimates of additional wages running into £119,600 a week.

£119,600 extra per week! It looks big. Multiply it by 52 weeks, and we find that, by putting a 10 per cent. import duty on manufactured articles, electrical manufacturers will pay in wages *an additional £6,219,200 per annum*, or *more than 3⅓ times the value of our total imports*! Was there no intelligent office boy available who could have prevented the *Express* from making itself so ludicrous? And this is "the great London daily," which is engineering the Tariff Reform movement! Is it possible for the commercial morality of the lay press to reach a lower ebb?

"No Answer!"

WE forwarded an advance proof of the above article to the editor of the *Daily Express* on Tuesday last. The following is all that the editor has to say, in his Wednesday morning issue, in reply to our two columns of figures and arguments :—

ABUSE NO ARGUMENT.

The ELECTRICAL REVIEW, a perfervid Free Trade paper, is very angry with the *Express* for instituting its Tariff Inquiry. Its editor has favoured us with an advance proof of a leading article full of diatribe such as the following:—

"Was there no intelligent office boy available who could have prevented the *Express* from making itself so ludicrous? And this is the great London daily which is engineering the Tariff Reform movement! Is it possible for the commercial morality of the lay Press to reach a lower ebb?"

We stated the other day that the foaming at the mouth of our opponents was most encouraging to us. It shows that when there is no further argument for them they take to abuse; which means acknowledgment of defeat.

We are not concerned here as to whether, and what, good there may be in Tariff Reform. What we are concerned with is the grossly misleading methods adopted by some advocates of the new doctrine. It is pitiful that any cause, however good and however necessary it may be regarded, should be championed in such a fashion.

The Bremer Arc Lamp Patent.

FROM a report appearing elsewhere in this issue, it will be observed that Mr. Justice Parker has reversed the decision of the Comptroller in which he revoked this arc lamp patent. He found that one of the appellants, the British Westinghouse Electric Co., had made a *bonâ fide* attempt to establish their arc lamp industry in this country, and had used their best endeavours to fulfil their obligations under the Act. The Act was not intended to penalise a want of success where the patentee had done his best. As to Koerting & Mathiesen, his Lordship accepted their reasons for the small way in which the patent was worked here. The subject is one of great interest, and we shall express ourselves on the decision next week.

Supply of Electricity Outside the Area.

BY a Bill which has recently been before the House of Lords, it is proposed to allow local authorities supplying electricity to grant a supply outside their statutory area, subject to the consent and approval of the Board of Trade. The circumstances under which the privilege would be conferred were outlined by Lord Hamilton of Dalzell on

May 11th, when he explained that in case of any application being made under Clause 5—which enables electricity to be supplied to railways, tramways and canals, partly outside the area of supply—the Board would carefully consider all the circumstances. In particular, the Board would endeavour to prevent any extravagant speculation on the part of local authorities which might injuriously affect the interests of the ratepayers, or of consumers of electricity within the area. The Earl of Onslow pointed out that this was satisfactory so far as the local authorities were concerned, but it was just as necessary to keep a vigilant eye on private undertakings. At present there is no procedure, short of an Act of Parliament, by which an electric lighting company or a local authority supplying electricity can obtain power to give a supply outside its area. So far as local authorities are concerned, the complaint that they have powers and do not exercise them is just as frequent as the complaint that they may not go outside the area. With regard to private companies it cannot be too often pointed out that much may be done without statutory powers of any kind. There is nothing to prevent a limited company supplying electricity upon any terms it pleases that may be arranged. Of course difficulties may be put in its way by the local authority objecting to allow mains to pass over or under the highways; but it is probable that a judicious arrangement as to supply for street lamps on easy terms may overcome the objections of the local authority.

Condensers and Lagging Current.

As a sort of *finale* came the President's paper on the use of condensers in heavy electrical engineering after the annual general meeting of the I.E.E. on Thursday last week. The subject is not a new one, but it is possibly of more interest just now than ever before, owing to the increasing use of induction motors in connection with present day A.C. power supply.

Mr. Mordey makes a comparison of costs, &c., of the use of condensers and over-excited synchronous motors, for a circuit requiring 1,000 KW., at 10,000 volts, 50 periods, with a 0·8 power factor, and estimates that the former would cost initially 65 per cent. of the latter, while its running loss would appear to be but 25 per cent. of that of the motor, quite apart from savings in other directions.

The paper touches on a debatable question, viz., the reliability of any condenser for this class of work, and it is much to be regretted that time did not permit of any representative opinion being obtained.

In many cases it is possible to compensate for lagging current by a judicious selection of plant, without going to the expense of installing a special compensating motor, as at Sheffield, but as the use of induction motors appears to be generally on the increase, the matter is one which will have to be seriously reckoned with sooner or later.

The German Cable-Makers' Syndicate.

It has required scarcely more than three months of open competition in the cable manufacturing trade in Germany to bring the makers to a decision to reconstitute the syndicate for the inland market. The combination was dissolved early in February, in consequence of the inability of the constituents to arrive at an agreement with an outside competitor, as represented by the Bergmann Electricity Works Co., which recently started the production of cables for lighting and power purposes, and which demanded as a condition of its association with the syndicate a tonnage allotment in the whole of the trade, which the then members of the syndicate were not prepared to concede. Under the circumstances the syndicate collapsed, and the rivalry which immediately ensued became so keen that the prices of cables for heavy work declined, it is said, even to 30 per cent. less than the cost of production. The result of the cutting is now indicated by the announcement of the re-formation of the syndicate with the addition of the formerly outstanding firm as a constituent. The syndicate now comprises the Allgemeine Elektrizitäts Gesellschaft, Siemens-Schuckert Werke, Felten & Guilleaume-Lahmeyer Werke, Bergmann Elektrizitäts Werke, Land und Seekabel Werke, Kabelwerk Rheydt, Heddernheim Kupferwerk und Suddeutsche Kabelwerke. It is understood that the new syndicate, which apparently does not concern itself with the export trade, has been formed for a period of five years.

Electricity in Cornish Mines.

Very gradually the hide-bound conservatism of the Cornish tin mine manager is giving way to the pressure of "foreign" persuasion, and the glad news reaches us, through the *Western Morning News*, that the premier tin mine of the county and of the world has decided to adopt electric pumping.

At the recent general meeting, the Chairman stated that after prolonged and anxious consideration, the joint recommendation of the manager and a firm of consulting electrical engineers, to drive the pump and stamps by electric motors, had been adopted. They found that the installation of a Cornish pumping engine would cost more than if the motive power were electricity, and the situation was improved further by the possibility of saving over £20,000 capital expenditure, by taking power from the supply company instead of generating it themselves. The manager added that reliability would be secured by the provision of duplicate pumping sets, and a lower annual overall pumping charge than at present would be obtained. One gathers from the report that the manager was quite apologetic about his recommendation, but this may have been more for the purpose of placating the very strong Cornish pump division, than from genuine reluctance to abandon the traditional machinery.

It would be foolish to attempt to hide the fact that some of the first applications of electricity in Cornish mining were not immediately successful, but we rather suspect that this was due to the supposition that what did well in one kind of mining would suit all kinds; or it may be that the first motors were under their duty. Whatever the cause, it was never in reasonable doubt that a compact electrical plant distributing power to motors all over a mine, and in particular to the stamps and pumps, must be economically superior to the sacrosanct Cornish engine. The efficiency claimed by the old mining engineer and mine captain for this engine, no matter how ancient, reminds us of the boiler tests of certain makers, but no one can doubt that it was and is a wonderful engine, and that it filled a place which could not have been occupied by any other type of steam engine.

If the boom in tin had lasted for a slightly longer fraction of the eternity which the sanguine company promoter prophesied, there would have been a larger number of mines equipped with electrical machinery, but the golden age came and passed like a comet, leaving Cornish mining in a stronger condition than before, but not staying long enough to bring to maturity many new ventures which were likely to prosper in good hands. Short as the time was, it proved enough to enable the electrical idea to be hung in everyone's mind, thanks to the energy of the local supply company and of certain manufacturers who did their part well after the way was opened by the enlightened actions of the London financiers, to whom Cornwall appears at present to owe so much.

Having gained a footing, nothing can stop the continuous encroachment of electricity upon the field of the steam engine in the Duchy, and the next steady rise in tin ought to bring all the larger mines into the fold of modern progress.

ELECTRIC DRIVING IN A PAPER MILL.

Owing to the fact that steam is largely used in paper mills for heating and boiling purposes, mill owners are apt to think that electricity cannot show any advantages over steam for machine driving. When electricity is produced on the site, the exhaust steam from the electric generating plant can be used both for heating and boiling purposes, and even when electricity is taken from public supply mains, and a boiler used for raising steam for heating, considerable advantage could often be shown both in points of economy and in controlling arrangements as compared with the ordinary steam drive.

Paper works owners are perhaps a little sceptical, too, as to the ability of the electric drive to give them all the speed range and control that is required in driving the various machines in the paper works. There is practically no limit to the speed range obtainable by electric driving if the scheme is properly carried out.

The Basted Paper Mill Co., of Sevenoaks, acting on the advice of their consulting engineer, Mr. Frank Broadbent, M.I.E.E., adopted electric driving for their recent extensions. They, however, had already decided to drive the new pulp machine itself by steam for the reasons already suggested above.

The generating plant consists of a Belliss compound engine coupled direct to a Siemens generator, the set being fitted with a fly-wheel of about double the weight usually fitted to the standard sets, so as to cope with sudden fluctuations in the load which it was foreseen would be thrown upon the plant. During the test, intermittent overloads of 50 per cent. were thrown on the generator without producing any appreciable drop either in speed or voltage. From the switchboard in the generator house a pair of paper-insulated lead-covered and armoured cables are laid underground to the new buildings. Where the cables cross a stream a heavy wooden girder has been thrown across to support them, and where they pass under the floor of the works they are run in earthenware pipes. Elsewhere they are laid direct in the ground and filled in without further protection than is afforded by the armouring and heavy yarn protection.

The cables feed a distribution box in which a pair of switch fuses is provided for each motor circuit. From this distribution box the cables, which are all insulated with vulcanised india-rubber, are run in the open on insulators throughout, and a very neat job has been made of them. This part of the work, together with the motors, all except that for the calender machine, was carried out by Messrs. W. A. Stevens, of Maidstone. Fig. 1 shows the main distribution box with the cables leading from it.

Each motor is provided with a switch panel consisting of angle iron frame upon which is mounted a D.P. switch, combined starting and regulating switch giving a speed range of about 2 to 1 by shunt control, and an ammeter marked in horse-power.

Although the cables are run throughout on insulators, they are protected where they are within reach by a sheet-iron guard. One of these guards is shown on the left-hand side of the motor in fig. 3.

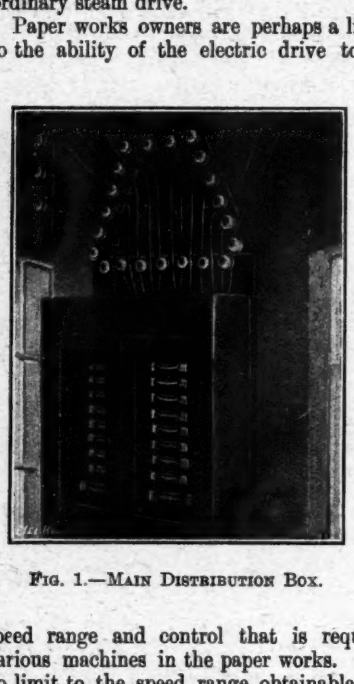
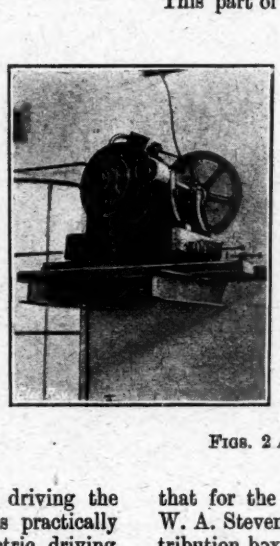
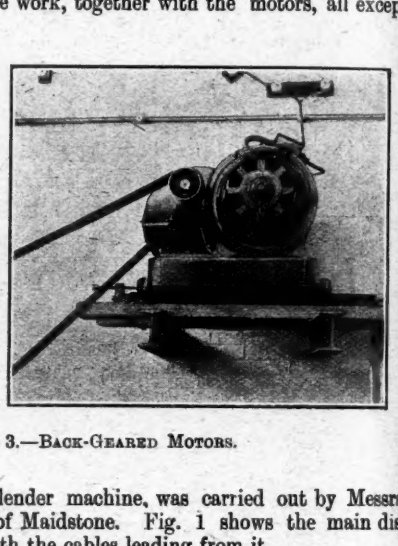


Fig. 1.—Main Distribution Box.





Figs. 2 and 3.—Back-Geared Motors.

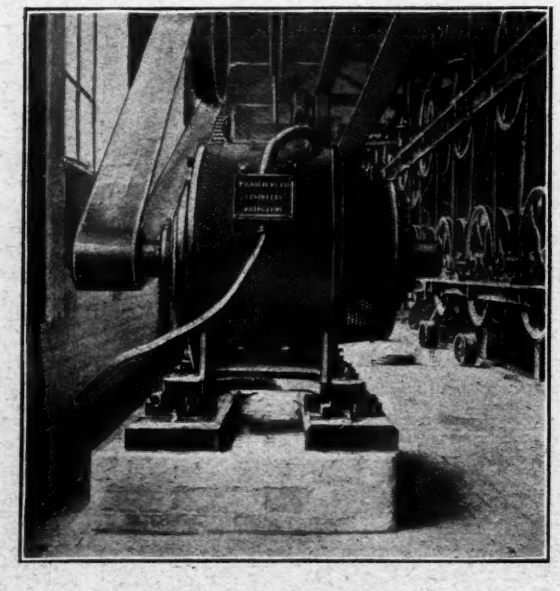


Fig. 4.—Motor Driving Fan.

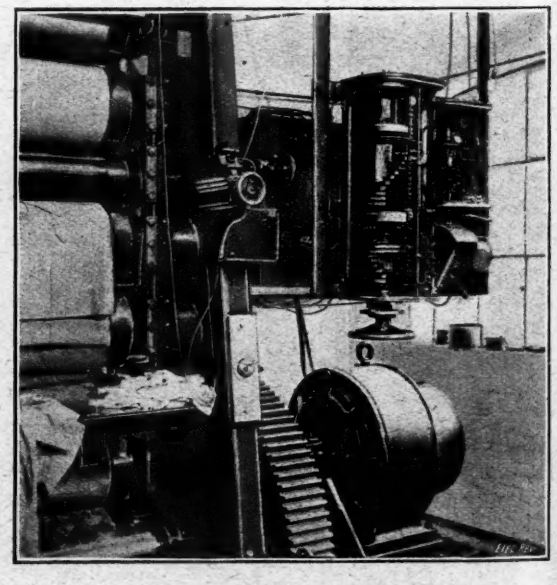


Fig. 5.—Motor Driving Calender.

The speed of most of the machinery in a paper works is very slow, necessitating in many cases gear reduction between the motor and the driving pulley of the machine itself. Back-geared motors have therefore been used generally throughout, and two of these are shown in figs. 2 and 3. These motors are each driving cutting machines, and in order to leave the floor space around the machine quite clear, they have been mounted, as shown, on girder brackets let into the wall. A similar method has been adopted for the sizing machines. One of the illustrations shows the gear; in the other the gear case is fitted.

Fig. 4 shows one or two motors driving by belt the fans and dryers of the drying room.

In all these cases a speed regulation of about 2 to 1 has been provided for by shunt control.

Several Blackman fans are fitted high up in the walls, and driven by small motors arranged on brackets beneath.

The calender machine is one of the most important machines in a paper works next to the pulp machine itself, and requires a very wide range of speed control. Mr. Broadbent has treated this machine very much on the same lines as a rotary printing press, and has provided what is practically a printing-press equipment. This is illustrated in fig. 5, which shows the motor and the drum controller with case removed.

Steady leading-in speeds are obtained as low as 5 per cent. of the maximum speed for threading the paper between the rollers, and the speed can be advanced by fine increments to full speed. The machine can be stopped instantly by means of press buttons fixed on the machine, no matter in what position the controller may be. The motor, however, cannot be started again without bringing the starter back to the first position.

The perfect control and wide range of speed obtainable are much appreciated, and the method of driving is preferred even to the direct steam engine drive which was in use before. It is probable that, had the owners appreciated what could be done in the way of electric driving, the pulp machines themselves might have been electrically equipped.

We are indebted to Mr. F. Broadbent, the consulting engineer, for the photographs from which our illustrations have been prepared.

A NEW SOURCE OF PEAT FUEL.

By THOMAS TOMLINSON, B.A.I., M.I.C.E., M.I.E.E.

The leaderette under the above title in your last issue throws a very much needed searchlight ray upon the pretentious edifice which the promoters of the Ekenberg process of peat utilisation have raised, and which looks so huge and substantial through the vaporous denseness of the *Times* advertisement.

Just such another appeared in the *Graphic* of January 16th, 1908, when the camera was called in: Dr. Ekenberg posed beside a microscope, medallions made from peat, &c.

No one expects much information of value in a magazine or newspaper article dealing with science or engineering, and one is not surprised at not finding it; but in the official descriptive pamphlet one expects enlightenment.

One does not in this case get it, and one is driven to quite other sources less resolutely reticent in essentials, and happily less prodigal of non-essential statistics as to bog areas and output of Chilian nitrates.

My two main sources of information are:—"Peat and Lignite," by Mr. H. E. Nystrom: A Report to the Canadian Government made in 1908; and "Peat Converted into Coal," a former pamphlet of the Ekenberg Co. If, in assuming that the process is now essentially as therein described, any injustice is done to Dr. Ekenberg or his system, I feel sure the columns of the Review will be open to any statements backed by facts and figures which he may choose to make.

Peat as dug from a bog consists of about one part by weight of peat to nine parts by weight of water, and the whole problem of peat utilisation is to get rid of the water at the least possible cost, for the material is not so valuable as to stand much cost of manipulation. A peat bog is not a gold mine—though the Ekenberg promoters appear to think so, from the dividend promised and from the fact that Dr. Ekenberg's figures were checked by an assayer. An intelligent contractor's navvy who knows what it costs to shift a ton, and excavate a cubic yard, would be a more suitable checker; for it is a matter of handling 10 tons or 13 cb. yards for 1 ton of produce.

The invention on which the whole Ekenberg process is based is that peat as dug when subjected to a temperature of about 300° F. is partly carbonised, and that after it has been subjected to this treatment, the water may be extracted partly by pressure of about 1 ton per sq. in., and partly by heat.

During 1904-5 an experimental plant was erected at Stafjso, the Swediah Government helping with a substantial subsidy. The process was worked there as follows:—(1) The peat was excavated from the bog; (2) pulped on the bog; (3) conveyed to the works; (4) elevated into hoppers containing six days' supply; (5) fed through boilers or "ovens" at about 150 lb. pressure without escape of steam, and with partial recuperation; (6) pressed in a filter press; (7) dried by waste heat; (8) briquetted—a quite formidable series of operations for such a material, and one of such a low value.

The cost of these operations, as estimated by Mr. Larson, is as follows, American tons of briquettes with 12½ per cent. water and American dollars being changed into pence per English ton anhydrous:—

Bog	4·48d.
Digging and transport	30·72d.
Labour cost at plant	32·00d.
Amortisation and interest	51·20d.
Administration	16·00d.
Extra	9·80d.
	144·00d.

or 12s. per anhydrous ton of net product. The actual figure given is $2·25 (9s.) per American ton of briquettes.

On the same authority we have it *as an estimate* that the fuel required for the supply of power and for heating the boilers or "ovens" will be 37 per cent. of the fuel produced, so that, if we take 63 per cent. of the above figures, we shall have the cost per anhydrous ton handled. This gives:—

Bog	2·82d.	
Digging and transport	19·7d.	
Labour cost at plant	20·8d.	
Amortisation and interest ...	32·2d.	42·3d.
Administration	10·1d.	
Extra	6·18d.	
	91·80d.	

or a total of 7s. 7d. per anhydrous ton handled.

We are now in a position to apply a few rough checks (call them "navvy" checks) to this estimate.

A simple and useful approximate relationship connects tons anhydrous with tons and cubic yards of peat *in situ*; to produce 3 tons of anhydrous peat, we must handle 30 tons or 40 cb. yards.

On the above estimate, therefore, it is claimed that peat can be put through all the eight operations detailed above, and maintenance, depreciation and administration be provided for at a total cost of 9d. per ton handled, or 7d. per cb. yard. I do not for an instant believe that it can be done.

Another rough check: It happens that in the same report there are records of the actual price at which peat briquettes are produced on this same Stafjso bog. The equipment in this case is very simple—all successful bog plant is simple—and consists of two peat machines driven by 8-H.P. gasoline engines. The labour consists of 12 men, 1 boy and 3 horses. The peat is simply (1) excavated; (2) pulped; (3) spread; (4) cut up; (5) turned; (6) stacked—altogether a series of simple operations representative of the best modern practice of practical peat winning.

The digging, pulping and laying out on drying fields cost 41d.; interest, amortisation and general expenses amount to 37d.; the total cost is 9s. in all per anhydrous ton.

The actual 41d. corresponds to the estimated 19·7d.;

the actual 37d. to the estimated 42·7d.; the actual 9s. to the estimated 7s. 7d.

The 19·7d. is obviously too low—the lowest figure I can find for this work is 30d., and the average of seven bogs is 41·6d. If 37d. per ton represents interest, amortisation and general expenses on the simple Anrep equipment as detailed above, it cannot be seriously contended that an extra 4·6d. per ton can possibly represent the increase upon the complicated and costly machinery required by the Ekenberg process. The 2s. 7d., therefore, does not represent the probable cost per ton (anhydrous) of stuff treated, or, in my opinion, anything near it.

There is no suggestion that the estimate was not made honestly and in good faith—the calculations are all given to two places of decimals; but there does appear to have been a neglect of the application of such rough practical checks as are particularly necessary when estimates based upon uncertain or assumed data are in question.

One rough check, though probably not available for Mr. Larson's estimate, was certainly available for his successors, or should have been: this was the actual performance of the plant at Stafjso.

For the only hint of this we have to go to the *Graphic* reprint:—

"Dr. Ekenberg made his discovery in 1903. It created a great interest at the time in his native country, and the Swedish Government appointed a Commission to investigate the process. Upon the recommendation of this Commission, a subsidy was granted to Dr. Ekenberg for carrying out his experiments. A small factory was erected, and the process was worked successfully from a practical point of view, but from the commercial standpoint the cost of production did not allow, in competition with coal, a sufficient margin of profit, therefore the matter remained in abeyance, pending further improvements.

The last paragraph is amusing in its naiveté. There is no success open to a peat fuel scheme, except to sell at a profit in competition with coal. As well talk of the successful working of an aeroplane which did everything but fly.

It is noteworthy that the other plant on the same bog apparently does compete quite successfully with coal, selling its produce at 33⅓ per cent. above the cost of production. (See Canadian Report, page 43.)

Photographs of the Stafjso plant were given in the previous pamphlet, and these show it to have been upon a thoroughly practical scale—such a scale, in fact, as cannot have failed to have given actual figures for the cost of production per ton of briquettes, for the actual power necessary and for the actual proportion of the total peat treated which was consumed as fuel. These should never have been made a matter of estimating when facts were available.

Coming now at last to the later pamphlet, the gist of it is in this statement:—

ESTIMATED PROFITS.

The profits from a production of 2,000,000 tons briquettes per annum (which is a very low estimate for all countries where the process is patented, considering that the coal consumption in Great Britain, U.S.A., Germany, France, Russia, Belgium and Austria alone, is over 725,000,000 tons per annum), are estimated as follows:—

Sale of 2,000,000 tons peat briquettes at 12s. per ton	£1,200,000
Cost of production at 4s. per ton, which includes value of the peat, wages for excavation, transport to the factory, and wages in the factory, depreciation and maintenance of plant, as well as administration and sundry expenses, after deducting the value of the sulphate of ammonia	400,000
Annual gross profits	£800,000
Interest on capital invested (£3,000,000) at 6 per cent.	180,000
Yearly net profit	£620,000

Equal to over 20 per cent. on the capital invested.

Remembering that Mr. Larson's estimate—which we consider too low—was 9s. per American ton of briquettes, or 10s. per English ton, this reduction to 4s. per English ton is startling.

It means that the cost per actual ton produced with 12½ per cent. water is 30d., or, per actual anhydrous ton handled, 34d.

Now the average cost in practice of merely getting the peat, pulping it, and conveying it to the factory is 41d., whence it appears that it costs just 7d. less than nothing per ton to perform all the other operations of the Ekenberg process and to maintain and administer.

Also it means that 1 ton of raw peat can be put through all the operations for under 3½d., or 1 cb. yard for under 2½d.

I would gladly examine the calculations leading to this very astonishing result, and to the 26 per cent. dividend, if any were available; but none are. We are informed that:—

Mr. Dellwik computed the cost per ton of briquettes to be 6s. 8d. (without) recovery of by-products.

and further:—

Mr. Stead, who has investigated the process as regards the value from the chemical and engineering standpoints and carefully checked the tables given by Dr. Ekenberg, has come to the conclusion that these figures are substantially correct.

The reader may from the foregoing remarks form his own judgment as to the value of the computation and the certificate of correctness; the subscribers will most assuredly do so sooner or later.

As for me, in a paper read last December before the Institution of Civil Engineers of Ireland, I expressed the following opinion of the process:—

"I do not doubt that you *can* boil a bog if you want to do it; but . . . . I cannot see any chance of either fun or profit in the operation."

THE ELECTRIC SCRUBBER.

In a recent issue we referred to this device, the invention of Mr. W. R. MacDonald, who is also bringing out a waterproof motor. The electric scrubber was designed for the purpose of cleaning the bottoms of ships without dry-docking them; the cost of docking is extremely heavy, and the want of a convenient and effective alternative has for long years pressed heavily upon the owners of shipping, for cleaning is necessary at frequent intervals, in spite of the use of very costly anti-fouling compositions, and the presence of fouling is immediately reflected either in increased coal consumption, or in the still more expensive form of diminished speed and loss of time.

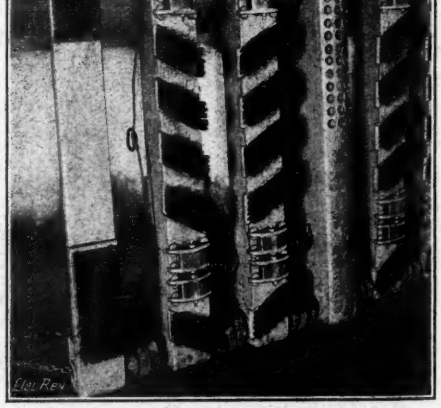


FIG. 1.—PART OF THE SCRUBBER.

With his "electric" scrubber, Mr. Macdonald succeeded in solving the problem by simple and effective means. The device consists of a flexible "hogging-brush," such as used to be employed (though with little efficacy) for cleaning wooden ships, which is dragged up and down under the steel

hull of the ship with ropes, the essential feature of novelty being that by the use of waterproof electromagnets, the brush is made to cling firmly to the plates.

Fig. 1 is a view of part of the scrubber, or "mat," ready for use; it is composed of a series of battens carrying the brushes and magnets, held together by chains on which cork disks are threaded to give buoyancy and to separate the battens. At each end is a chain bridle to which the

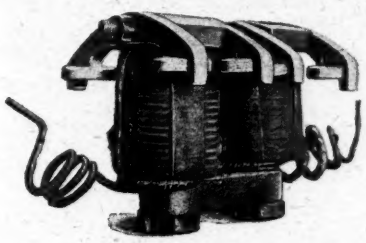


Fig. 2.—One of the Electromagnets.

hauling hawser is shackled. The hawser at each end passes through a fair-leader block which is shackled to a position chain, and so is taken to a steam winch.

The mat itself has at each end a leading batten without a magnet, and six ordinary battens, each fitted with two magnets and a set of brushes. In the mat shown there are also two "dumb" battens which are used to adjust the buoyancy. The leading battens have each two large brushes set square and in way of the magnets. These brushes clean those strips which would otherwise be untouched by the brushes of the middle battens; they also clean a path for the magnets. On the middle battens the brushes are set diagonally, half being skewed to the right and half to the left; in this way any tendency of the mat to run crooked is counteracted. Fig. 2 shows a magnet and coil removed from the batten; it will be seen that the face of the magnet is curved, the reason for which is supplied by an explanation of the working of the mat.

When the mat has been got over the ship's side and into position, the current is switched on. In that condition the apex of the curve of each magnet touches the ship's side, but

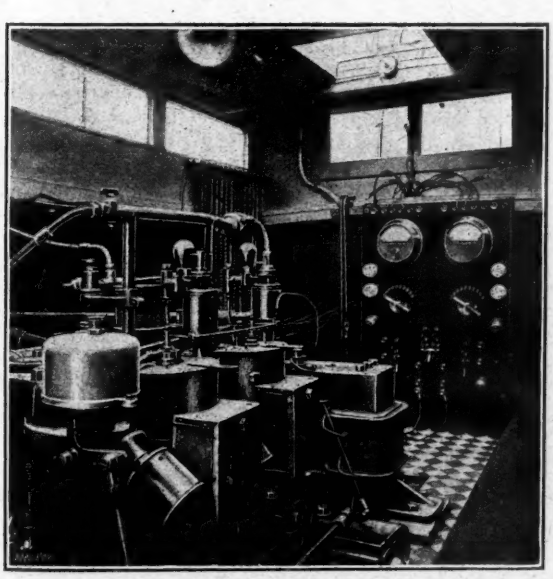


Fig. 3.—Engine-Room of the ss. "Wayfarer."

the brushes do not touch. When hauling begins the battens cant, thus bringing the fore edge of each brush into contact with the ship; at the same time, of course, the fore side of the magnet becomes engaged. The backs of the battens are so contrived as to ensure this canting or rocking; and, since the mat has to travel indifferently forward and aft, the arrangement has to be "double-ended." Thus each leading batten has its back made with one bevel on its outer edge, but each middle batten has both edges bevelled.

The shape of the magets does not allow the battens to cant sufficiently to bend the bristles to any great extent. There is thus a constant vibration in every direction, normally to the ship's side, owing to the fact that a couple is set up by the pull of the magnet and the resistance to the brushes, and laterally, because the skew at which the brushes are set into the battens causes the whole apparatus to vibrate laterally. The effect is that each batten as it advances flicks the filth out in front of it; and an important feature is that the vibration clears the brushes and prevents them from clogging.

The necessary current is supplied from the dynamo of the Ship Cleaning Co.'s tender, but it can equally, if desired, be supplied from the dynamo of the ship which is being cleaned. From actual experience it is found that the total magnetic grip of the mat is well over a ton. A test was made with a single magnet on the hard steel cover of an ammunition hoist, and the pull was found to be 280 lb. It was also found that two men could stand on a single batten when it was attached by its magnets to the ship's side. Another result of experience is that a greater grip is found to be needed for the very hard steel of modern armour plates than for ordinary steel ship plates. The strain on the hauling hawsers fore and aft is about $1\frac{1}{2}$ tons.

The scrubber has been tried on ships of every type, and with complete success. It can be got out in an open roadstead, in any weather and with any tide; indeed, the tide helps to get it into place. It calls for few men to work it, and it does its work quickly and thoroughly. An 18,000-ton battleship can be scrubbed in 12 hours; and ships scrubbed by this method have on subsequent docking proved to be perfectly clean. It will be seen that the method is as suitable for a tramp steamer as for a man-of-war. The gear has been carefully designed, so simple and strong, that little special skill or care is needed in working it; it can, therefore, be used by the ship's company, and in the case of men-of-war scrubbed, it has been so used. But in the case of merchantmen with small crews the conditions are different; it might be found to be neither convenient nor desirable to use the small amount of labour available for this purpose, and it is therefore the intention of the Ship Cleaning Co. to provide its own workmen as well as all necessary gear. All that will then be necessary will be for the tender to make fast alongside, and to put her men and gear on board the ship under treatment.

The company can clean a 4,000-ton ship, providing labour, current and all gear necessary for £20; the time taken would be about eight hours. The Ship Cleaning Co., Ltd., of 23, St. Swithin's Lane, London, E.C., who are the patentees and manufacturers of the complete gear, will have a party on the Clyde this summer engaged in boot-topping the fast passenger steamers. Experience has shown that the sides of these ships for some 5 ft. under water foul so much more quickly than the bottoms, that it is necessary to scrub them thrice as frequently as the bottom and bilges.

In order to do this it has been the custom until lately to lay the ships ashore for a tide, a process generally involving night work. Now, however, they can be boot-topped with the electric scrubber in one hour, and at a cost of £5. One "fleet" of the scrubber forward and one aft on each side is all that is needed.

One of our views (fig. 3) shows the engine room of the inventor's launch *Wayfarer*, in which the oil engine is coupled either to the propeller or the dynamo at pleasure, and generates current for demonstrations of the electric scrubber when required.

Bennis Stoker Contracts.—We have received from Messrs. E. Bennis & Co., Ltd., of 28, Victoria Street, S.W., a long list of contracts that have been received by them for their high-duty smokeless coking stokers for a number of different industrial works and manufactories connected with paper and flour mills, breweries, leather and glue works, numerous textile manufactories, ironworks, &c.

Accrington Exhibition.—Firms desiring to be represented at this Exhibition (August 30th to September 7th) are invited to communicate with Mr. Harold Gray, the borough electrical engineer.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Suction Pipes for Condensing Plants.

With reference to the letter signed "W. G. T." in your issue of May 14th in reply to my criticisms upon the above subject, I admit that "W. G. T." puts forward a very strong argument in favour of rubber "suction limbs" when he states that during seven years the supply has never failed. Apparently his experience has been a happy one. Mine was certainly the reverse. I also admit, in reading through my letter again of April 30th, that some of my remarks about power stations possessing rubber suctions are rather sweeping. I am pleased to learn from "W. G. T." that there are still several in actual service.

Although "W. G. T." gives instances of eight works where they are in use, I still hold, and always shall, that an equipment of this kind is always open to the troubles I have already described.

I cannot agree that the cleaning of the 12 strums in question can be a simple task, especially as this takes place every day. It was just this matter of cleaning which was always found so difficult at the best of times. As I have argued before, the use of rubber hose for suctions necessitates the strums being placed at approximately 20 to 25 ft. from the river bank, which is the very worst position as regards the collection of all kinds of *débris* during ebb and flow of the tide.

In time of flood or "fresh," even if it is possible to clean them, the process would have to continue at regular intervals during the 24 hours, say, every 30 minutes. This is why I claim that under similar conditions a rigid pipe taken out into deep water away from the "swirl" experienced close to the banks would be infinitely superior in every way to rubber suction limbs. The pipe might be perforated or open ended, but so long as it could be occasionally converted into a discharge, there would be very little trouble compared to suctions equipped with armoured hose. *Of course*, "W. G. T." would find the strums he mentions buried in the material drawn towards them, and with which they are *also surrounded* in this position—it is the natural conclusion.

With regard to dumping stones to form an artificial bed, I recall a case in which stones were used for this purpose, but it was certainly not in a part of the river where there was much navigation.

It served a very useful purpose, and *never* silted up. The strums were placed upon the stones, and, in addition to the artificial bed thus formed, had circular sheet-iron "flukes" at either end, which kept them well off the bed. The equivalent to this is done in modern undertakings with rotary strainers, and, moreover, in rivers where there is a great deal of navigation.

It is usual for the pipes in this case to have a large block of concrete, in the form of an apron, surrounding the ends, which are open.

Allington Johnston.

London, S.W., *May 17th*, 1909.

The Electric Lighting Acts Amendments Bill.

This Bill proposes to stop electricity departments of Corporations manufacturing, fixing, or selling anything whatever except electricity to the public, except through a contractor. Naturally, there will be a very great diversity of opinion on this subject. If Corporations are prevented from wiring or motor hiring, they are entirely in the hands of local contractors. The supply station may be splendidly managed, but unless the contractors do good-class work and canvass energetically, the Corporation engineer's work is of little value.

Another point also crops up: the interests of the contractor and of the supply authority are not identical. The latter wish for long-hour or large consumers of electricity, whilst the former does not care about these things, but only desires a large number of lights and prompt cash payment.

Unless the Electrical Contractors' Association is able to weed out the shoddy contractor from our midst, the Corporations in self-defence will have to be given powers to prevent the shoddy contractor doing work and employing untrained men or boys as wiremen. One important town at least has already experimented in this direction.

W. A. Toppin.

Greenock, *May 18th*, 1909.

The Use of Electricity in Mines.

The report appearing on pages 864 and 865 of your current issue respecting the West Stanley disaster refers in several paragraphs to switchgear as possibly being responsible for the explosion leading to the lamentable calamity under consideration.

In the last paragraph of your report, Mr. John Wilson also draws attention to the urgent need of facing the problem, and if possible proving that the gear at present in use is not open to the criticisms which are levelled at it.

Certain extracts from Dr. Thornton's report suggest the use of switch boxes with side flanges and rubber joints, which design is still open to severe criticism, and without further safeguarding may lead to serious accidents, as, for instance, that which recently occurred at Ackton Hall Colliery.

Switchgear for mining work has received careful consideration, and designs are already on the market which the writer believes to be safe *electrically and mechanically*, but in these days of strenuous competition does not the price of the gear and not the design in almost every instance receive the greater consideration? This gear, which is obtainable for pressures up to 650 volts A.C. or D.C., is constructed on the following lines, and appears preferable to that referred to by Dr. Thornton, although the features he mentions are not embodied, for reasons referred to later.

Machined metal surfaces, closely fitting, are resorted to, so that the boxes may be as dust and gas-tight as practicable and necessary without relying upon rubber, leather, or any other flexible packing which may deteriorate or easily become damaged. Dust is not likely to assemble on the interior if properly machined and fitted. Gas is free to diffuse (and will do so even with flexible packing in the course of time), and an explosive mixture may accumulate inside the switch or fuse chamber. This mixture may also be ignited due to operation of the switch or melting of the fuse, even while the condition of the mine is such that a naked light or spark would cause irreparable damage.

It is, therefore, necessary that the path through which the heated gases (resulting from an explosion internally) should travel from inside to outside the case be such that the gases are sufficiently cooled to prevent external ignition. Further, the boxes themselves must be so constructed that they will withstand without risk of mechanical damage such internal explosions (it was apparently due to such mechanical damage that two men unfortunately lost their lives at Ackton Hall colliery a short while back).

Switchgear constructed to meet these conditions, if properly constructed, appears to be safe, and as before mentioned, can be obtained. It, however, costs more than the type of "gas-tight" switchgear with which we are all only too familiar, and so accidents happen, are investigated, recommendations are made and forgotten, because most of us prefer to take the risk and keep our money.

P. W. Rand.

Manchester, *May 24th*, 1909.

Mercury Motor-Meters.

With reference to the letter of Mr. Schofield in your issue of 21st inst., I emphatically deny that my first letter was a copy of any circular, or that it is to my benefit to draw attention to any type of meter. I have not seen the circular, and have no interest whatever either in the circular itself or in its origin. When I read the letter of "Strebor," I saw that I could corroborate what he had stated, and, along with him, I await an explanation through the medium of the Review.

I note that the British Electrical Apparatus Co., in their letter, refer to gold commutators; that was one of the good

points I noticed in the meter I referred to in my first letter, and I still maintain that with a gold commutator and also gold brushes the commutator type is easily the most efficient meter. I quite agree with the suggestion made by you that the cause of the trouble may be independent of the supply, and that is another reason why I should like to see the matter discussed in public.

A user is best able to form an opinion as to the merits or demerits of any particular type, and consequently I decline to adopt Mr. Schofield's suggestion of referring to manufacturers; not only for my own benefit, but also for that of others who may be faced with the same difficulties, the matter should be settled in the columns of your paper.

Mercurio.

["Strebor" has also written to the same effect as "Mercurio," insisting on open discussion; his letter came to hand too late for insertion.—EDS. E.R.]

PARLIAMENTARY.

Central London Railway Bill.

On May 18th the Select Committee of the House of Commons, of which Sir J. Compton-Rickett is chairman, commenced the consideration of this Bill. The Hon. J. D. Fitzgerald, K.C., with Mr. H. Lloyd, K.C., and Mr. Courthorpe Munroe represented the promoters, and petitioners against the Bill include the Great Northern Railway, Corporation of London, Metropolitan Railway and the Scottish Provident Institution.

Mr. Fitzgerald, K.C., for the promoters, said that the Bill proposed to make a short extension of the Central London line from its present terminus at the Bank, to Liverpool and Broad Streets Stations. They also proposed by the Bill to construct two subways, one at the British Museum connecting the line with the Holborn Station of the Great Northern and Piccadilly Tube, and another connecting the existing station at the Bank with the booking hall of the City and South London Railway. With regard to the second subway, it was a question which concerned the Corporation of London and the Scottish Provident Institution, and was really a clause matter, and would come up on clauses. The Central London line was opened in 1900, and had undoubtedly been of enormous public convenience. By the extension the public would be able to get right into Liverpool Street or Broad Street stations without going into the street. There were an enormous number of passengers who arrived daily at those stations, and it was most desirable in the public interest and the public convenience, and in the possible advantage to be derived by the companies, that the gap which existed should be filled up. There were over 6,400 omnibuses which left and arrived at Liverpool Street every day, and the majority of them passed down Broad Street, and ran along the route followed by the Central London line. The length of the proposed line was 700 yards. The only opposition in preamble was that of the Metropolitan Railway, who objected to the proposed extension on the ground of competition.

Sir Henry Oakley, chairman of the company, giving evidence, said that the Great Eastern Railway and the North London Railway had met them most handsomely. They had given them the land and allowed them to construct the line under their railways. Both those companies had treated them as agreeable visitors rather than as a company from whom money might be extorted. The London County Council, the Corporation of London and the police were all agreeable to the scheme. They could have three sets of lifts, one carrying the passengers up to the Great Eastern Railway, another to the street, and the other would run up to the North London Railway. Since the introduction of the motor-omnibuses, they found that their short-distance passengers showed a very considerable reduction. The cost of the extension would be £300,000, and to get a 5 per cent. return on that they would have to carry 4,000,000 passengers per annum, which would be equal to 12,000 passengers per day for 300 days. If they kept up the average fare of 1 85d. per passenger which they now got, they would derive £30,830. The fare would be 1d. from Liverpool Street to Chancery Lane.

Cross-examined by Mr. Balfour Browne, K.C., for the Metropolitan Railway, Witness said that he knew there was a clause in the Bill whereby the promoters were not to extend their line in a northern or easternly direction without the consent of the Great Eastern Railway.

Mr. Frank Ree, general manager of the London and North-Western Railway and the North London Railway, gave evidence in support of the Bill.

Mr. G. F. S. Gooday, general manager of the Great Eastern Railway, replying to the Chairman, said that if an exchange station was made between the Central London Railway and the North-East London Railway, he should consider it a violation of the agreement in the Bill now before the Committee.

On May 19th, Mr. Balfour Browne, K.C., opened the case for the Metropolitan Railway who were opposing. In addressing the Committee, he said that this was not the first time the Central London had brought forward the scheme for extending the line to Liverpool Street. As long ago as 1892 the company were granted the powers, and if it was an important thing it should have been carried out there and then. Instead they had altered the scheme in various ways, and now they came after such a lapse of time and revived the proposal in what he ventured to say was a most objectionable manner, both to his company and the public. The line at Liverpool Street would now be a block one, and in the interests of the Great Eastern Railway. That company was to be placed in the position of saying, "Thus far and no farther without our consent." He protested against railway managers being placed in the position of Parliament. Referring to the agreement between the G.E.R. and the promoters, Counsel contended that it would prevent any other railway from getting into the Great Eastern Railway district.

Replying to a question by a member of the Committee, Mr. Browne said he agreed that in a sense, if the Bill were passed, it would carry out the views of the Committee on Tube Railways, who said that the tube railways should extend to the suburbs. This line, although not itself running into the suburbs, would be connected with one which did. He maintained, however, that the Great Eastern Railway would be placed in the position of monopolists of the North and North-East of London.

Replying to the Chairman, Counsel said the agreement was the whole ground of his company's objection.

Continuing, Mr. Browne said that his company had spent £2,000,000 in electrically equipping their line, and it was hard on them that the traffic which they had acquired should be taken away from them. No member of the public had been called in favour of the Bill, and he contended that no public case had been made out for the necessity of the extension. In conclusion, he asked the Committee, even if they were in favour of the preamble of the Bill, to strike out the clause embodying the agreement with the Great Eastern Railway.

Sir Charles Maclaren, M.P., chairman of the Metropolitan Railway, was called, and said the great bulk of his company's capital had been spent within the metropolitan area. They had had to purchase a great deal of property at a heavy expense. The electrical equipment of the line had cost £1,700,000, and this had had to be done by the expenditure of new capital, as it was impossible to replace the old stock out of revenue. Whilst the change of system had been very satisfactory from the public point of view, it had been very disastrous to their revenue. Before their electrification the net revenue was £230,000, but last year it fell to £41,000, and the dividend had dropped to ½ per cent.

Mr. H. Lloyd addressed the Committee for the promoters, but

The Chairman said the Committee had considered the clause in the agreement between the promoters and the Great Eastern Railway Co. The clause provided for the Great Eastern Railway giving the land for the construction of the station on the condition that it should be treated as the terminus of the Central London Railway, and that the promoters should make no attempt to extend in a northernly or north-easternly direction without the consent of the Great Eastern Co. The Committee felt that they could not pass the preamble of a Bill which absolutely prohibited an exchange station with any other railway which might be authorised in the future.

Mr. Lloyd said that his clients would not regard it as their duty to oppose any suggestion for an exchange station.

After a consultation, Mr. Lloyd submitted the following proviso:—"Provided that nothing in this sub-section shall be construed to impose upon the company any obligation to oppose any application to Parliament by any other company for powers to make an exchange station or subway to connect with the railway of the company."

The Chairman intimated that this proviso would be acceptable.

On May 20th Mr. Rigg, K.C., for the City Corporation, asked that the subway at the Bank should have an exit to the street at St. Swithin's Lane. The Chairman pointed out that such an exit would be outside the limits of deviation. Mr. Rigg accordingly did not press the matter. The subway will, therefore, only have the existing exits.

Mr. Rigg also brought up a clause providing that on Sundays and Bank Holidays the company should not charge any higher fare than that charged on week days. After a short discussion, Mr. Lloyd, at the suggestion of the Chairman, said he would accept the clause "as an example to other companies."

Mr. Lloyd, concluding his speech for the promoters, said that with reference to the contention of the Metropolitan Railway that the proposed line meant competition, he did not for a moment say that there would be no competition. Obviously there must be, but he would ask the Committee to consider whether having regard to all the circumstances it was not in the interests of the public that the line should be constructed. Although there would be competition at certain points they had to remember that it might mean an increase in the traffic for all. They were asking powers to raise the existing workmen's fare from 2d. to 2½d. It might be said they were penalising the workman, and not the ordinary traveller, but he would remind the Committee that the company had power to charge 1d. per mile, which would mean a 6d. fare. They were not charging their maximum fare. The extra fare would only be charged if the person travelled over the whole line. After a short consultation with his clients, Mr. Lloyd said that the company were willing to say that for six months after the opening of the extension they would undertake to charge the 2d. maximum fare, and if they found during that time they had a sufficient number of passengers to cover the working expenses, they would not go beyond the 2d.

At the suggestion of the Chairman, Mr. Lloyd said they would try it for 12 months.

Mr. Mott then gave engineering evidence as to the proposed subway at the Museum Station. There would be a moving staircase between the two stations, from platform to platform. The

public would be able to travel both up and down. There was no opposition to this proposal; and the Committee then passed the preamble of the Bill.

Sir Henry Oakley was recalled to give evidence as to whether it would be possible to issue through season tickets between the Great Eastern Railway and the Central London line. He said that he would rather that the matter was left over so as to give the promotors time to see what traffic they would get from the Great Eastern, and the difficulties which might arise.

After further discussion, the Chairman said they would make it a recommendation from the Committee, but they would not impose it.

Folkestone, Sandgate and Hythe Tramways.

(*Concluded from page* 838.)

Resuming on Thursday, May 20th, after a week's recess, the Committee heard the case for Folkestone Corporation.

Mr. A. F. Kidson, town clerk, said that it was in the North Ward area and the Cheriton Road, in which the tramways had been authorised, and which the company were now asking to drop, that the tramways were mainly supported. Replying to the Chairman, Witness said he thought the promoters should be put under an obligation to construct the line in two or three years.

Alderman A. E. Pepper, Mayor of Folkestone, said that there was a general opposition to overhead tramways in Folkestone, and he did not think the company in 1906 would have obtained the Council's consent if the inhabitants had known that it was eventually to be on the overhead system. He admitted in cross-examination that he recognised the uncertainty of the stud systems. He did not think tramways in the hands of the municipal authorities would pay.

Mr Baker, general manager of the Birmingham Corporation tramways, gave expert evidence as to the satisfactory working of the Lorain system. He contended that it could be worked with commercial success. Cross-examined, witness said he could not understand anybody recommending the conduit system when they had a "first-class contact system like the Lorain." He himself, however, had not had any experience in the construction of a tramway on the Lorain system.

On Friday the opposition of the Earl of Radnor was taken. His Lordship stated in evidence that he was a large owner of property in Folkestone and Sandgate. He supported the scheme for tramways in 1901, because the Corporation promoted the Bill. The Corporation, however, parted with their rights to the National Electric Construction Co., and as had been stated by the promoters, the latter proposed to alter the mode of working. If the promoters undertook to construct the line on the conduit system down Sandgate Hill, and the whole of the work was undertaken at the same time, he would give way if it was thought that the tramways were required in the public interest.

Mr. L. G. A. Collins, local estate agent for Lord Radnor, gave details as to the class of property past which the tramways would run.

Mr. Freeman, K.C., then addressed the Committee on behalf of Lord Radnor, and asked that if the tramways were sanctioned that the whole system should be carried out at the same time, and he further asked that the line down Sandgate Hill should be constructed on the conduit system.

Local evidence was then given on behalf of the Town Council of Hythe who are opposing the Bill. Mr. H. Strahan, member of Council, detailed the various proposals made before Parliament for a tramway service in Hythe. He could not exaggerate the feeling in the borough against the proposed overhead system. There was a very large majority when a poll was taken against changing the system from that originally proposed. They were perfectly willing to have any system that was underground.

Mr. Lewis Coward mentioned that the promoters had come to an agreement with the South-Eastern Railway Co., whereby the promoters should not construct overhead lines between the Sea View Hotel, in the Seabrook Road, and the Roman Catholic Church without their consent, and, in addition, that of a majority of the lessees and occupiers of land along the road.

Mr. Vesey Knox, K.C., in his address to the Committee for the Hythe Town Council, contended that there was no public necessity for the tramway—it was a purely pleasure line. He maintained that the promoters had made a bargain, but would not bear their share of it. He asked the Committee not to let the promoters get out of a Parliamentary bargain which they themselves had made. His clients would be perfectly willing to have the Lorain system. As the promoters' Bill of 1906 stood, they had to pay a penalty of £1,000 to the Hythe Council if the work was not substantially commenced within one year. That period had elapsed, but the Council were willing to waive their right to the claiming of that money if the promoters would undertake to lay down an underground system and to carry the whole of the work out at the same time.

After further evidence and speeches on Tuesday, the Chairman, after conferring with his colleagues in private, announced that the Committee found the preamble of the Bill proved only so far as related to the extension of time, and they suggested two years.

L.C.C. Tramways Bill.

(*Concluded from page* 839.)

On the 19th inst. the Committee further considered the proposal to construct the line from Battersea Park Road, over Battersea Bridge, to King's Road, Chelsea. Police evidence having been given to the effect that if a double line of tramways were constructed over Battersea Bridge that bridge ought to be widened, Mr. Shirley Benn (chairman of the Highways Committee of the L.C.C.) expressed his view that the cost of widening the bridge would be prohibitive. A long legal argument took place as to the sufficiency of the compensation clause in the Bill, and ultimately the Committee decided to pass this portion of the preamble.

North-East London Railway Bill.

On Tuesday, the Committee on Unopposed Bills, presided over by Mr. Emmott, had before them this Bill, under which it is sought to extend for another year the period for the raising of the capital necessary for the commencement of the works.

Mr. W. Webb said he apologised for coming to the Committee again, because last year when the period was extended the Chairman intimated that that would be the last time an extension would be allowed. As they knew, the promoters were authorised to construct a tube railway from the City to Leyton, Walthamstow, Chingford and Waltham Abbey. It was passed in 1905, and up to the present time all the local authorities had continued their support to the Bill, although naturally they were disappointed that nothing had been done. He had resolutions from all the local authorities still supporting them.

The Chairman: We want to know what chance you have of raising the money. What has occurred in the last 12 months to make you think you can raise the money?

Mr. Webb said his first point was that there was a great public necessity for the railway and that the local authorities without question approved of the Bill. He would also point out that even the London and North-Western Railway had not been able to issue the capital required for its tube railway to Watford. The financial people in the City who supported their Bill at the start were still behind them, and were prepared at the first favourable moment to undertake the issue of capital. The contractors had agreed to accept stock to the amount of £800,000, which materially reduced the amount which would have to be raised, and so soon as the market was favourable the money would be raised. They were advised by their friends that the times were becoming more favourable, and that if the extension was granted them they might look forward hopefully to raising half the capital in the ensuing year. He appealed to the Committee to look upon their application favourably.

After further discussion, the Chairman said that what he wanted was some financial evidence from the City with regard to the probability or possibility of raising the capital during the next 12 months. Mr. Webb said he had not got the evidence that day, and he asked for an adjournment.

The Chairman postponed the Bill until after Whitsuntide.

Southport and Lytham Tramway Bill.—This Bill, which provides for the abandonment of the undertaking authorised in 1899, was on May 18th before Lord Onslow's Committee of the House of Lords on Unopposed Bills, and was ordered to be reported for third reading.

West Kent Electric Power Bill.—This Bill was before Lord Onslow's Committee of the House of Lords on Unopposed Bills on May 18th, and the preamble was declared proved. Under the Bill the West Kent Electric Co., Ltd., which was incorporated recently, asks that all the rights granted to the Kent Electric Power Co. may be transferred to it for the supply of electricity within the West Kent area of supply. The limited company also propose to take over the powers granted by the Board of Trade in 1903 to the Kent Electric Power Syndicate, Ltd., for the supply of electricity for all public and private purposes within the rural district of Bromley.

Manchester Corporation Bill.—After two days' hearing, the Select Committee of the House of Lords presided over by Lord Ludlow, passed the preamble of the Manchester Corporation Bill. No opposition was offered to the clauses for new tramways, for which estimates of £30,000 were prepared.

Holywood Tramways Bill.—This measure came before the Chairman of Ways and Means Committee on Thursday, May 20th. The Bill is promoted by the Holywood Tramways Co., and provides for an extension of time for the completion of tramways authorised in 1904 for three years. It was mentioned that a clause had been inserted giving the Belfast Corporation the right of purchasing such portions of the line as were in the city boundary. The Bill was ordered to proceed.

Dudley Corporation Bill.—The Chairman of Ways and Means on May 20th ordered this Bill to be reported for third reading. It enables the Corporation to grant leases of any tramways belonging to them, including tramways and light railways which may hereafter be acquired from the British Electric Traction Co., the Dudley, Stourbridge and District Electric Traction Co., the Birmingham and Midland Tramway Co., the Wolverhampton District Tramways, Ltd., and the South Staffordshire Tramways Co.

Edgware and Hampstead Railway.—On Thursday, May 20th, the above Bill was down for hearing, but it was stated that the only opposition had been withdrawn, and accordingly the Bill was referred to the Unopposed Bill Committee.

Second and Third Readings.—In the House of Lords on May 19th the following were read a second time:—Preston, Chorley and Horwich Tramways and the York Town and Blackwater Gas (Electric Lighting, &c.).

In the House of Lords on Monday the West Kent Electric Power Bill was read the third time and passed.

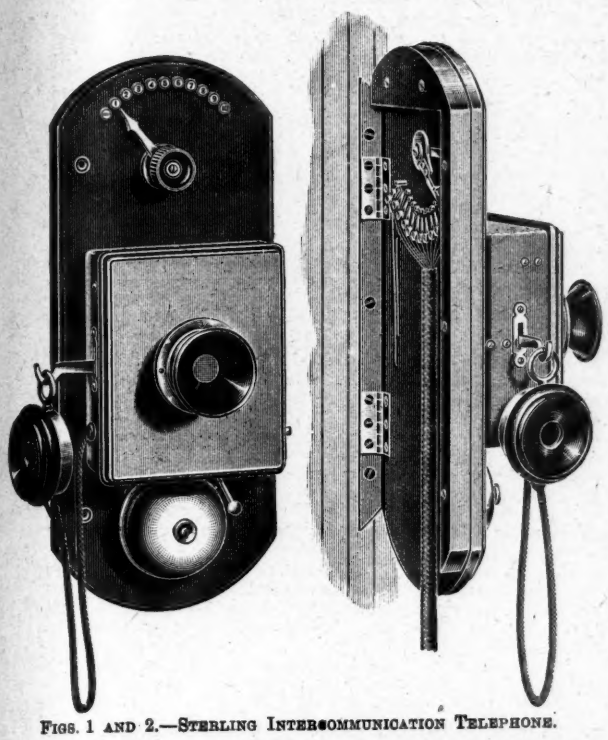
The House of Commons on May 21st approved the Lords' amendments to the North Metropolitan Electric Power Supply Bill.

Royal Assents.—The Royal Assent has been given to 18 Bills, including the Anglo-Argentine Tramways and the North Metropolitan Electric Power Supply Act, 1909.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

New Intercommunication Telephone.

Everyone who has used an intercommunication telephone with an automatic restoring device must realise the great convenience it affords, in that it entirely obviates the necessity of replacing the selecting switch to the home stud when answering a call.



Figs. 1 and 2.—Sterling Intercommunication Telephone.

Hitherto, the "automatic" has been an expensive device, requiring in most designs a separate movement for each line at each instrument; thus the number of movements increases as the square of the number of stations, and in a large system, where the self-restoring device is most necessary, the cost of the apparatus becomes a very serious matter.

To meet an obvious want, the Sterling Telephone & Electric Co., Ltd., of 200, Upper Thames Street, E.C., have introduced a new patent telephone instrument, quite similar in appearance to the ordinary non-automatic instrument, in which all the advantages of the full automatic are secured by means of a single ingenious but simple piece of mechanism. This is so arranged that the act of ringing disconnects the receiver from the home line and connects it to the line selector switch. After conversation the replacement of the receiver on the switch hook automatically restores the connections to the normal position, and connects the receiver to the home line in readiness to answer a call. The line selector switch is disconnected, so that in answering a call it may be left in any position whatsoever, without any possibility of cross ringing or other undesirable effects. The simplicity of the device is such that the complete instrument costs little or no more than the ordinary instrument not provided with a self-restoring attachment. Another advantage is that, the caller's home line being disconnected during a conversation, the cross talk due to the capacity of the line is halved, though it is not claimed that anything approaching, secrecy is obtained. It will be seen, in fig. 2, that the Sterling Co. hinge the backboard, which enables the instrument to be fixed and connected with the utmost ease. Another useful feature is that the contacts are arranged below the pivot of the line selector switch at the back of the instrument, so that the wires may be more conveniently connected, while the contacts themselves are covered with a papier-maché case (not shown). The step-by-step contact device is extremely neat, it being rendered impossible to touch two contacts at once or to leave the switch anywhere except upon a contact stud.

Electric Fans at Home and Abroad.

The electric fan season has arrived. It is not a very big affair in this country so far, though it will become of greater consequence year by year as the public is encouraged to cultivate the electric habit, using the electric radiator for warmth in winter, and the electric fan for ventilation and coolness in the summer. A long and sultry summer will do good to the electric fan business, even in these Islands, if only the public be attracted and educatively persuaded. Though the trade in electric fans for home use in private residences is not so large as we should all desire, the electric fan fashion for our public buildings is growing more satisfactorily. But it is in exportation that a number of our fan manufacturers find far better business. In some parts of India, for example, electricity supply authorities experience a capital day-load from fans on circuit. The accompanying picture shows the interior of St. Thomas's Cathedral, Bombay, with an array of

Crompton Electric Fans in a Bombay Cathedral.

electrically-driven fans, which does the heart of the electrical engineer good when he sees it. They are Crompton ceiling fans, which have been installed by Messrs. Greaves, Cotton & Co., of

Bombay. Would that every such public building in this country had as pressing a need! How many of our churches, theatres, public halls and so on there are, in which there is a real need of more efficient ventilating arrangements all the year round. As we have said, a good deal has been done, but how much more remains undone! Let us hope that those whose duty it is to pay heed to the health and comfort of the public as it gathers in its hundreds and its thousands, will recognise their duty and responsibility, and call in the electrical engineer and contractor to advise and carry out the much required improvement.

"Sylverlyte" Reflector.

The "Sylverlyte" Shade and Reflector Co., of 4, Milk Street, E.C., have brought out a new cardboard shade for incandescent lamps, in which the reflecting surface has the appearance of silvered canvas, the irregularity of which ensures the diffusion of the light. A brass cap is fixed to the apex of the shade, to facilitate attachment to the holder, and slots in this cap provide for ventilation of the interior of the shade—a point which is generally ignored, with the consequence that when carbon-filament lamps are used, the holder often becomes extremely hot. The device is neat and effective.

LEGAL.

The Bremer Arc Lamp Patent Litigation.

[In *re* the Patents and Designs Act, 1907, and in *re* George Braulik's application to revoke Bremer's Letters Patent, No. 18,786, of 1902.]

In the Chancery Division on Friday, May 21st, Mr. Justice Parker resumed the hearing of the above application, which was adjourned from March last for further evidence as to the working of the patent in this country, and the steps taken by the owners to work it.

The matter came before Mr. Justice Parker by way of an appeal by the British Westinghouse Electric and Manufacturing Co., the proprietors of the patent, from a decision of the Comptroller ordering revocation.

Mr. Walter, K.C., representing the appellants, having reminded his Lordship of the facts of the case, submitted that this was really a claim by British manufacturers against Messrs. Koerting and Mathiesen, who held the licence from the Westinghouse Co., and were represented in this country by the Union Electric Co. With regard to such a case as this, there was express exemption. Though saddled with a considerable disadvantage, the Westinghouse Co. continued to manufacture under the present arrangement. In 1905 they made 145 lamps, in 1906 they made 106, in 1907 they made 527, and in the next year, 1908, 530 up to November 2nd, and they had at that time in stock 274 lamps. The company were not only saddled with the opposition of their licensees, but they had also to deal with numerous infringers. After the licence was granted Messrs. Koerting & Mathiesen, through the Union Electric Co., imported in 1906 2,467 lamps.

Mr. Bousfield, K.C., for the applicant, said that only part of those were lamps manufactured under the patent, and he proposed by technical evidence to show that that was so.

Mr. Walter said that they were lamps manufactured under the licence.

Mr. Bousfield said that his instructions were that only a part were constructed under the letters patent in question.

Mr. Walter, continuing, said that in 1907 3,612 lamps were sold by the Union Co., and in 1908 2,777 lamps. As regards the infringement in this country, there were steps taken by the Westinghouse Co. In 1906 they issued a writ against a company, particulars of objection were put in, and the plaintiffs, feeling that perhaps their claim was too wide, on September 25th, 1907, obtained leave to amend. The patent was amended, and a fresh writ was issued against the company. In the meantime, that company went into liquidation, and the receiver and liquidator consented to a perpetual injunction. A fresh action was then commenced against Braulik, the respondent to the present appeal. The date of the writ in the action against Braulik was January 2nd, 1908, the statement of claim was delivered in July, and on November 12th, 1908, a defence was put in. The petition for revocation was lodged on October 20th. The response to the action for infringement was to lodge a petition for revocation under all the circumstances. He submitted that this was not a case that the Act of 1907 was intended to deal with; and he asked his Lordship to hold that there was not such want of adequate manufacture in this country within the meaning of the Act as to bring this patent within the penal clauses of the statute. The Westinghouse Co. had attempted to establish the manufacture in this country, and had practically failed, and they had accordingly adopted the only course left open to them, viz., to grant a licence to the only persons they could find who were willing to take it. He submitted that the Westinghouse Co. having manufactured in this country to an extent which fulfilled all the demand that there was for these lamps, it could not be said against them that there was not an adequate manufacture in this country as required by the Act.

Evidence having been given in support of counsel's statement as to the working of the patent by the Westinghouse Co.,

Mr. Bousfield, on behalf of the petitioner, submitted that the respondents to the petition had not complied with the section. He submitted that the agreement which the British Westinghouse Co. had entered into with the German company showed that the Westinghouse Co. did not intend to seriously undertake the manufacture of arc lamps in this country. It was consistent with the British Westinghouse Co.'s view to let these lamps be sent from abroad so that they could get their money in royalties in that way. He contended that the company, having regard to the evils the Act was passed to remedy, had no right to make a business arrangement of that kind to the prejudice of a British industry. Patentees in a sense had, having regard to the fact that a patent was granted to them, a British industry in partnership with them, and they were bound to do what they could to encourage a British industry. He quite agreed that from the applicants' point of view it was very good business that the German firm could go on sending into this country thousands of lamps a year and paying a royalty upon them.

His Lordship: At the date of this agreement they had spent a lot of money in trying to establish an industry, and failed. They then found a man who could do it. They either had to fight him or come to some terms with him. What is there unfair to the British industry in those terms?

Mr. Bousfield replied that it might have been a reasonable bargain to make, so far as the parties to it were concerned, but asked whether any result could have been expected from the licence except the result that had flown from it. In 1906 the British Westinghouse Co. were practically manufacturing no lamps at all in this country in accordance with the patent, and in March of that year a licence to manufacture was granted by the British Westinghouse Co. to Messrs. Koerting & Mathiesen, and under that licence the Germany company paid a royalty upon every lamp made under the patent and imported by them.

His Lordship said that the case for the applicants was that nobody was willing to take a licence but Koerting & Mathieson.

Mr. Bousfield said the obvious intention of the agreement was that the British Westinghouse Co. meant to get their profits out of the royalties.

His Lordship could not understand what other course the British Westinghouse Co. could have pursued under the circumstances.

Mr. Bousfield replied that to his mind the question was what course his Lordship ought to pursue. The first question was, had the patented article been manufactured to an adequate extent here, and if not, had there been a satisfactory reason given? In a former judgment upon the Act his Lordship had already dealt with what was "adequate extent" and "satisfactory reason." He (Counsel) was satisfied with what his Lordship said in that judgment about that. The word "adequate" was a word which connoted means to an end. What was the mischief aimed at by the statute? Patents were not to be used for the purpose of developing industries abroad at the expense of home industries. Therefore, the end aimed at by the statute was, as far as possible, to favour the development of industries in the United Kingdom, instead of patents being used to favour the development of industries abroad. He submitted that when one had to define what "adequate extent" meant, one had to look at the mischief the statute was aimed at.

His Lordship: You do not want to penalise a man who has done his best.

Mr. Bousfield: Have these people done their best?

His Lordship: The question might have been different if the patent had not been in dispute.

Mr. Bousfield said that they must assume, for the purpose of this case, that the patent was valid. If it was invalid, there was an end of the petition for revocation. The British Westinghouse Co. must have known that, as a result of what they did, they would only be able to put on the market a miserable 200 or 300 lamps made in this country. He submitted that, upon the evidence, his Lordship was bound to find, as a fact, that the lamps had not been adequately manufactured in the United Kingdom, and that the British Westinghouse Co. had offered no satisfactory reason why they had not.

Mr. Sargeant having been heard for the Board of Trade, his Lordship reserved judgment.

In an application with reference to Letters Patent No. 23,606 of 1902, Mr. Walter, K.C., said the case was on all fours with the previous case.

His Lordship, in delivering his reserved judgment on both applications on Tuesday last, after reviewing the history of the matter, said:—

Now I have given the matter a good deal of consideration, and I have come to the conclusion that the company have been, and are still, making a *bonâ fide* attempt to establish in this country an industry in arc lamps. They acquired the Bremer patents, including the patent of 1902, for this purpose, and they have expended large sums of money with this end in view, beyond what they paid to Bremer. It is by no means an easy thing to establish an industry for the first time. Both managers and workmen must buy their experience, and the attempt becomes the more difficult if it must be made in the teeth of the competition of a firm who have already acquired a great reputation for the quality of their own goods, and have access to English markets. If, however, the person who attempts to establish such an industry has patent rights in this country, such patent rights are, of course, of great value, for they will enable him to exclude, or limit, the competition which otherwise might prove fatal; but even such patent rights may be of little use if the competitor is in a position to put goods on the market which he can sell by virtue of his reputation, even if they do not contain the latest improvements. In the present case it was obviously the right policy of the company to use their 1902 patent to limit, or exclude, competition from Koerting and Mathiesen. Possibly they might have succeeded in stopping altogether the importation of goods made by the latter under the

Hogner patent. They came to the conclusion, however, (and I am not in a position to say it was a wrong conclusion) not to attempt this, but to use their 1902 patent to limit the competition they feared. By the agreement of March 12th, 1906, they handicap Koerting & Mathiesen to the extent of the royalty imposed on them, and obtain a free licence themselves in respect of the Hogner patent, thus using their patent rights to increase, and not to diminish, the chance of being able to establish an industry in arc lamps in this country. It is true they limit their own power of granting licences at royalties below the fixed minimum, but I cannot see that this fixed minimum is unfair, and, if it were, it does not prevent anyone applying for, and obtaining, a compulsory licence. It is true also, that they limit their power of under-selling Koerting & Mathiesen in the British market, but it is still open to them to compete with Koerting & Mathiesen by putting as good or a better article on the market at the same price. If they succeed in establishing their patent rights, and can obtain a reputation for their goods before January 1st, 1911, they can determine the agreement of March 12th, 1906, and altogether exclude foreign goods made under their 1902 patent for the remainder of the term for which the patent was granted. I am satisfied that it is to their interest to manufacture, under their patent, to as large an extent as possible in the United Kingdom, for, leaving out of account the moneys expended in purchasing and experimenting with their patents, their profit on each lamp now made and sold by them is greater than the royalty they receive on each lamp imported and sold by Koerting & Mathiesen. I can find nothing in the company's conduct inconsistent with a *bonâ fide* intention to manufacture the patented article to as large an extent as possible in this country, and, as I have already said, the agreement of March 12th, 1906, is conducive to this end. With regard to the delay between the year 1903, when Koerting & Mathiesen first began to import lamps made under the Hogner patent, and the date of this agreement, it is, of course, true, that, had the agreement been arrived at earlier, the company would have gained in royalties, but as they were not in a position to put their lamps on the market before 1906, this would not have prevented Koerting & Mathiesen from being the first to establish a business in the patented article in the United Kingdom.

In my opinion, the company have throughout used, and still are using, their best endeavours to fulfil the obligation arising under the Act of 1907, by establishing in this country an industry in the article, the subject of their 1902 patent, and they have further proved, to my satisfaction, that their want of success up to the present time has been due to circumstances beyond their own control, and not to the manner in which they have exercised the rights conferred upon them by the patent in question. The Act of 1907 was never meant to penalise want of success when the patentee has done his best, and I cannot, therefore, come to the conclusion that the company's patent ought to be revoked.

With regard to Hogner's patent, Koerting & Mathiesen have not so strong a case for resisting its revocation as the company have for resisting the revocation of Bremer's patent of 1902. No doubt they can properly claim that all the lamps made by the company under the last mentioned patent ought to be taken as made under the Hogner patent for the purpose of considering whether Hogner's patent should be revoked. But Koerting & Mathiesen have made no attempt to work Hogner's patent in this country, otherwise than through the company, and it is largely due to the competition of lamps made by them abroad that the company have been able to manufacture and sell so few lamps in this country. On the other hand, they may fairly say that they have not only granted a free licence to a company which intended, and was presumably qualified, to work the patent in this country, but have precluded themselves from importing and selling competing lamps without paying a substantial royalty, Further, their position with regard to the Hogner patent has throughout been rather difficult. Such patent, so far as I can see, can be valid only if Bremer's 1902 patent be invalid, and then only if such invalidity be due to the objection based on disconformity. For some years litigation has been pending as to the validity of Bremer's 1902 patent, and, until its validity be decided, Koerting & Mathiesen have, I think, some excuse for hesitating to lay down plant with a view to working Hogner's patent in this country, more especially as their licence under the Bremer 1902 patent is terminable on January 1st, 1911. If it be ultimately decided that Bremer's 1902 patent is invalid, and Hogner's patent valid, and Koerting & Mathiesen do not then forthwith take steps for working Hogner's patent, or ensuring that it be worked to an adequate extent in this country, I think they will have great difficulty in resisting its revocation. I have, however, come to the conclusion that under present circumstances I may fairly accept the reasons given by them for the small extent to which the patent is worked in this country as satisfactory, and I come to this conclusion the more readily, because the revocation of this patent may make things even more difficult for the company who are, as I have said, doing their best to create an industry in the patented article in the United Kingdom.

I propose, therefore, in each case, to reverse the Comptroller's decision so far as it revokes the patent in question, but not to disturb his directions as to the costs of the proceedings before him. I shall allow no costs of the appeals except the Attorney-General's costs, which I direct to be borne and paid in the one case by Mr. Braulik and the company in equal shares, and in the other case by Mr. Braulik and Koerting & Mathiesen in equal shares. I deal with the costs in this way, because my decision is in each case arrived at upon evidence which was not, and ought to have been before the Comptroller, and which I have admitted only because these are two of the earlier cases under the Act, and I am not sure that either the company or Koerting & Mathiesen fully realised, or could be expected to realise fully, the onus which lay upon them.

My decision to allow further evidence on the appeals must not however, be taken as a precedent governing other cases.

Mr. Bousfield: In each case your Lordship says the petitioner and the respondent are to bear the Comptroller's costs in equal shares.

Mr. Justice Parker: I think it is the Attorney-General who appears, and not the Comptroller.

A Consumer's Lighting Bill.

A defendant in the Marylebone County Court, on Wednesday last week, declined to pay the house agent's account, which included a quarter's rent and the bill for electric light, on the ground that the charge for the latter was excessive. Defendant said he was charged £3 12s. 6d. for electric light for the past three weeks—a most preposterous charge. There was no electric light in the basement. They did not use electricity for cooking, and they had no festivities at Christmas. The bill for the 16 weeks during which he occupied the house was £9 5s. 9d.

His Honour: What is the charge for light? Defendant: 8d. per unit up to so many units, and 1d. per unit afterwards, but it is impossible to find out from the account rendered how many units are charged for; all you have got to do is to pay, or the supply will be cut off.

His Honour: Then the purchase of the undertaking from the Metropolitan Electric Supply Co. has not been an unmixed blessing to Marylebone?—Apparently not.

His Honour: It certainly is a most exorbitant charge, but I do not see that the defendant has any way out of it. There will be judgment for the plaintiff for the amount claimed, with costs.

Gould *v.* Lehwess.

(*Continued from page* 840.)

On the case being resumed, Dr. Lehwess, the defendant, examined, said that on November 30th he received from the plaintiff a cablegram in these terms: "Do I understand £25,000 in cash has been paid in?" Witness replied to that by cablegram: "All shares issued. Cash about £4,000 reserved."

His Lordship: What did you mean by the word "all"?—I meant that of the 25,000 shares, 21,000 had been issued fully paid. I meant that all the shares had been issued as if fully paid, except the 4,000 which had been reserved to be issued for cash.

It did not occur to you that he might read your answer as meaning that all shares had been issued for cash?—It did not occur to me until it was discussed long afterwards.

Further examined, the Witness said that later on he saw the plaintiff in New York and pointed out the defects which had been discovered in the batteries; he told the plaintiff that when the batteries had passed the test he would pay for them, and plaintiff said, "Very well; I will look to you." Witness did say that the plaintiff knew that no money had been paid for shares except that which had been paid by the seven signatories. In the spring of 1908 his holding in the Electrobus Co. was about 12,000 to 14,000 shares. He took no part in the controlling of the Electrobus Co. The batteries in question were hired out to the Electrobus Co., but they proved very unsatisfactory.

Cross-examined by Mr. Bartley: Generally he would draw a distinction between cash capital and nominal capital, but he did not in the case of the plaintiff, who had peculiar ideas about company matters in this country.

On Friday, at the close of the defendant's evidence, Mr. W. M. Mordey, the President of the Institution of Electrical Engineers, gave evidence to the effect that the plaintiff could not possibly have fulfilled the tests prescribed for his batteries in the contract, as there was no battery manufactured that could meet such tests.

At the conclusion of the evidence and the arguments of counsel, his Lordship, in giving judgment, said he believed that the plaintiff insisted on having cash in the company which was to purchase the Gould accumulators, and the defendant knew it. Plaintiff supplied a number of batteries, and the defendant said he was not liable to pay because they had not passed the stipulated test. He came to the conclusion that the tests were not carried out because the defendant prevented their being made. He therefore returned judgment for the plaintiff for £2,528 15s. and costs.

The Consolidated Nickel, Tin and Copper Mines, Ltd., *v.* Crompton & Co., Ltd.

(*Continued from page* 840.)

On Wednesday, May 19th, Mr. Cragg, further cross-examined, said he saw to the supply and the putting-in of the fuses which were required as part of the installation. The fuses were the lightest they could get the motor to start with.

The strength of the fuses which you put in was determined by the very highest starting current which you required?—The starting current was not excessively high for the size of induction motor. They run about three times the normal running current, and it was hardly that.

It would have been a perfectly simple thing, would it not, to have had an arrangement by which you could have had a set of fuses for the starting current, and then you could have changed and had lighter fuses for the running current?—Yes, we could have made that arrangement if it had been wanted. It would have been unusual, though. It is a thing I have not seen.

Your fuses did not operate to prevent current passing to the motor until the safety point as regards the strength of that current had long been passed?—I cannot agree with that.

Mr. J. T. Leach, examined by Mr. Thomas, said he was an engineer in the employment of Messrs. Crossley Bros., Ltd. He

was at the mine three weeks erecting the plant. The engine was sufficiently powerful three times over to work the pump. Two of the men who were working the engine seemed a bit careless. When he went down to the mine on December 27th, 1907, he looked at the governor, and thought it had been taken to pieces, and not put together properly, but Jenkins denied that. Witness put it right in about 20 minutes.

Mr. W. J. Evans, called and examined by Mr. Abel Thomas, said that he was an engineer in the employ of Messrs. Crossley Bros., and he was called down to Chacewater on January 5th last. He was then informed by Capt. Tomkin that there was some trouble with the self-starter. He took it to pieces and found a piece of grit underneath one of the valves. He removed the grit, and it then worked all right. Witness did not think that the engines had been carefully looked after.

Mr. C. E. Sexton, examined by Mr. Abel Thomas, said he was an electrical engineer in the employ of Messrs. Cromptons, and was now the engineer in charge of contract work for the firm. He went down to Chacewater on August 22nd, 1907. At that time the temporary plant was running. When the motor was switched on the gas engine slowed up. He put that down to the gas plant not being run properly by the men in charge. It was not given sufficient attention. It gave him the impression that they did not understand the gas plant or the engine either.

Cross-examined by Mr. C. A. Russell: He and Cragg were working together to get the plant to work, and he sent several reports whilst he was at Chacewater. He knew that the delay in getting the plant to start was regarded as serious. They tried to get the rotor into a position in which it would not bind against the stator. Witness said that he considered plaintiffs' men to be ordinary unskilled men.

Counsel: Do you wish to suggest that Jenkins and the other men were trying to run this plant badly?—No; but they were prejudiced against it.

Re-examined by Mr. Abel Thomas: When you returned to London did you report that the men were unskilled and did not seem to know how to work the plant?—Yes.

Mr. J. Studer, principal armature winder for alternating-current machines at Messrs. Crompton's works at Chelmsford, was next called, and said he was of Swiss nationality, and had been engaged in some of the largest electrical manufacturing firms on the Continent. During the five or six years he had been in defendants' employ he had wound some hundreds of motors and alternators of various sizes. Witness wound the stator of the motor in question in accordance with instructions from the winding office. It was properly and efficiently done. When the machine was returned to the works in September, witness took it to pieces and examined it. He found that the three outside coils of the stator were burnt and the copper wire exposed. The bars of the rotor had been fastened with solder and rivets, but the solder had melted away.

Counsel: What, in your opinion, caused the solder to run like that?—A heavy current.

Can you tell by examining the windings of the stator if a breakdown is due to defective workmanship or bad material?—Yes.

And, in your opinion, was the breakdown due to any defective workmanship?—No.

Witness, continuing, said that when he rewound the stator he did not use any thicker wire, but wound it exactly as he had done in the first place. When the breakdown in November occurred, witness went down to the mine to rewind the stator again. This time the motor was totally burnt out. There was no insulation left on the stator, and the rotor was devoid of any solder. Again this must have been due to heavy current in the machine. Witness repaired it as before.

Mr. P. W. Freudemacher, estimating engineer for Messrs. Crompton, said that in October, 1906, he had an interview with Mr. Williamson, director of the Consolidated Co., with a view to giving an estimate for a pumping installation at the mine. Afterwards witness wrote to various engineering companies, among them the Worthington Co., Messrs. Joseph Evans & Son, Tangye's, &c., to obtain a quotation for a pump capable of delivering 1,000 gallons of water per minute against a head of 120 ft. In witness's opinion a pump specified for in those words meant a pump capable of delivering 1,000 gallons a minute against a 120-ft. head which was made up of the height due to the suction and delivery, and also the pipe friction. Mr. Williamson did not tell him that he wanted a pump to unwater a mine 120 ft. deep; had he done so witness would not have specified to the firm mentioned in the way he did. He would have first questioned Mr. Williamson as to the length and diameter of the pipe through which the water had to be delivered, and any curves there might be. Mr. Williamson seemed to know exactly what he wanted.

Mr. W. P. Miller, described as an engineer on the London staff of the defendant firm, stated that he went down to the mine on October 5th, 1907, to superintend the starting of the pumping plant. He found the motor coupling was out of centre with the pump coupling by about $\frac{12}{1000}$ of an inch. It was a flexible coupling, and therefore this did not in any way affect the running of the pump. They put it right, however, and the job took them a day, together with erecting the pump. They commenced pumping on the afternoon of the 9th, and the voltage before they put the switch in was about 550. Immediately it was put in it dropped to 270 or 300, with a starting current of 150 amperes. When the plant had got into its stride the running current was about 50 amperes and the volts 530 to 550. When they started, the motor and machinery ran very satisfactorily indeed, but during the first night they had to shut down because the engine backed out altogether through bad gas.

Mr. Abel Thomas: Was that from want of attention to the gas producer?—Yes, decidedly.

At the time, Witness said, he was at the engine end of the room near the switchboard. He pulled out the switch because the engine was slowing down; the short-circuit current was about 150 to 170 amperes, and the voltage had dropped to between 230 and 300. Under such conditions, of course, it would not have taken many minutes to burn out the machine. After witness had taken out the switch he went to the other end of the room, and he saw a man who had been lying down jump up and rush to his gas valve at the top end of the engine room; but, of course, that was no good at all. Witness then went into the producer house, and found the gas scrubbers very hot, showing that they had not had sufficient water supply. The water cock was not full on, and, in addition, was blocked a little bit. He reported to the defendants that, "with the exception of the gas falling off owing to driver's inattention, the plant had worked well." All through the following day the engine ran very well, but there was trouble again in the night. Witness did not stand by the plant that night again; but when he came down in the morning, witness found on examination of the plant that the lighting supply had all been stopped, and the lamps blown to pieces. The supply, witness explained, was run direct off the alternator. When they pulled out the main switch in taking the load off the alternator, the pressure went up to about 750, which, of course, was far too high for any lamp circuit. Therefore, when he saw the lamps had been blown, he knew they had had a "shut down" of some kind. Although the driver, when witness first came down, told him they had had no trouble during the night, it was afterwards admitted that "something had gone wrong." Witness could only give one solution, viz., bad gas, through inattention to the engine. During the rest of the time witness was there, they did not have much trouble with the plant. From what he saw of the plant, he thought it was a very good one, and, in his opinion, the burning-out of the motor was caused chiefly through the inattention of the men who had to work the plant. The motor was allowed too frequently to get out of step, owing primarily to bad gas. Belt-slip, too, might have had something to do with it. The belt stretching and slipping on the pulleys would have allowed the alternator to run under speed, whilst the engine was running at its proper number of revolutions. The two machines were placed so that the belt could have been tightened or loosened while the plant was working. Undoubtedly, the best man there was Jenkins. He did not know much of the electrical side, but he had a fairly good smattering of gas engine work, and when he was in charge he kept the plant running very well indeed. With the exception of Jenkins, none of the other men were any good; they did not know sufficient about the plant, nor did they know when anything was wrong. Witness intimated as much to Tomkin, and Mr. Williamson was also informed of the fact.

Cross-examined: Witness said that had the men working the plant been his own instead of the Consolidated Co.'s, he would have sent them all away except Jenkins. In his opinion the plant was not having fair treatment from the men who were there to run it, and there was a chance of a breakdown. He told his principals that the only thing that was wanted was that the men who were running the plant should be got rid of and proper men engaged.

Mr. J. B. Gall, F.I.C., chemist in the employ of Messrs. Callender's Cable and Construction Co., Ltd., said he had been instructed to analyse a sample of the water taken from Wheal Busy mine in November, 1907. He found it contained silica, iron oxide, lime, magnesia, soda, copper oxide, nickel and zinc oxide, sulphuric anhydride and chlorine. Free sulphuric acid was present to the amount of 4·67 grains per gallon. This would affect the metal of the pump, setting up a chemical action on the cast-iron and the bronze. In addition, there would also be electrolytic action set up. The presence of 5 per cent. of phosphorus in the bronze used for making parts of the pump made it all the more susceptible to attack by dilute sulphuric acid. From experiments he had carried out, he had arrived at the conclusion that there would be a difference of potential set up in the pump of 0·6 of a volt approximately when the pump was full of the acid liquor. The effect of that would be to cause a current of electricity with concurrent corrosion of the cast-iron surface. As the result of his experiments he found that the amount of corrosion from chemical action amounted to $\frac{1}{4}$ oz. over 1 sq. ft. of surface after 68 days' immersion, whilst through electrolysis for the cast-iron the loss in weight amounted to $\frac{1}{3}$ oz. per sq ft. after 67 days' immersion. In the mine itself he should say the loss would be heavier.

In cross-examination Witness admitted that the water which he experimented with was not actually water from the mine, but water which he had made up similar to it, and metal of the same analysis as that used in the Worthington pump. If they had had a sample of the water sent to them in the first place, they would have supplied a very different kind of cable to that which his firm did supply for the plant in question. Under such conditions, vulcanised bitumen cable was far better than rubber insulation. He agreed that the cable put into the shaft to supply the current from the generator to the motor was not the right sort.

Re-examined, Witness said that the water he analysed was taken from the bottom of the mine, and that the cable did not actually touch the water at all. There was no doubt that water splashed on to it to a certain extent. Bitumen-covered cable would undoubtedly be best to withstand water of such consistency, but on the other hand such covering was not so flexible as rubber.

Mr. Henry Winwood, advisory engineer to Messrs. Tangye, Ltd., engineers, of Birmingham, and principally associated with the pump building section of their business, said that the word "head" meant the total amount of work done by the pumping from the surface of the water to the top of the delivery, including all

friction in the pipes through which the water might be transmitted. With regard to corrosion, witness said it was rather a common thing in mining all the world over. In metalliferous mines it was very general. He had seen a sample of water from the plaintiffs' mine, and in his opinion it was an acidulous water, which would have a very considerable effect on the pump. The effect of the acids was hastened and intensified by the passage of water at so high a rate and under such heavy pressure. He should expect under the conditions in the mine, that the pump in question would probably deteriorate in 12 months to one-half its capacity. He had known pumps to wear out in three months where the water was very acidulous and there was a large quantity of grit.

Cross-examined, Witness did not agree that the salts formed by corrosion in the passages would be washed away by the velocity of the water travelling through them in regard to the pump in question. It was not usual when specifying for pumps to inquire the nature of the water. If the water was bad, customers generally called attention to it.

Re-examined, Witness said he should consider the plant in question an ideal one for pumping out a mine.

Mr. James Atkinson, M.I.Mech.E., examined by Mr. Abel Thomas, said he was one of the engineers of Messrs. Crossley Bros., Ltd. It was under his direction that most of the gas engines were made, and he had to decide what the weights of the fly-wheels were. This particular type of engine was a single-cylinder Otto cycle gas engine working on suction gas. The rims of the fly-wheels together weighed 2·2 tons; the fly-wheels had a stored-up energy in them of 185 ft.-tons when they were running at 200 R.P.M. Mr. Rosenbusch says nothing about the gas producer plant, with the exception that he suggests some dust may be taken in. Do you know of any way by which some dust may not be taken in?—There are no practical means excepting the one that is adopted on that engine; that is to say, the air is drawn through a filter which consists of an enclosed casing filled with bass matting. You could go to much more elaborate means, but they would not be practicable.

Examination continued: The fly-wheels were sufficient for driving the pump. If the fly-wheels had weighed 9 tons they would have had to have an out-board bearing to carry a portion of the weight, which would have made the engine cost more, and it would have been a worse engine for the purpose for which it was required. Irregularity due to bad gas would affect the motor in the way that the engine would run slower. Mr. Rosenbusch had suggested that the shaft was bent, but the fact that they had made so many engines with the same size of shaft was fairly conclusive that the shaft was not bent with the strain; he thought it was probably due to neglect to keep the bearings properly adjusted. From what he could gather the engine had been shamefully neglected. It required a man of a certain amount of training to work that kind of engine.

Cross-examined: These engines were used for almost every purpose for which power was required. The reason why they were not used for electric lighting was that they had not sufficient speed regularity for that purpose.

Mr. J. N. Boot, A.M.I.Mech.E., examined, said he was an engineer in the employ of the Worthington Pump Co., Ltd., which supplied the pump for the installation at Chacewater. He had been shown an analysis of the water taken from the Wheal Busy Mine, and he had seen that that water contained certain acids, which would in time tend to eat away the metal of the pump, and would to a certain extent decrease the efficiency of the pump. They knew that at various times the water pumped from the mine contained quantities of ochre, which would have a deleterious effect on the pump.

Cross-examined: Messrs. Crompton's had not given them any information as to the chemical composition of the water which would have to be pumped. If he were supplying a pump to the order of a mining company, if he had any doubt about it he would make careful inquiry as to the chemical composition of the water to be pumped. They supplied the pump on the assumption that the water which it had to pump would be of ordinary character.

(To be continued.)

Damaged Electric Light Fittings.

In the Official Receiver's Court, on Wednesday, May 19th, before Mr. Verey, the Block Light Co., of Clifton Buildings, Worship Street, City, vendors of electric light globes, lamp fittings, &c., sued Messrs. Thos. L. Field & Co., shippers, of St. Mary's Chambers, St. Mary's Axe, to recover damages in respect of 688 casks of goods which they had stored on the defendants' premises. They alleged that defendants had stored them carelessly, exposing them to the weather, with the result that they became so sodden and stained as to be of no market value. Defendants gave a general denial to the allegations.

The Official Referee having heard both sides, gave judgment for the plaintiffs for £266 3s., and costs.

Bergtheil & Young, Ltd., v. Argus Printing Co., Ltd.

In the City of London Court on Tuesday, before Judge Lumley Smith, K.C., a claim was made by plaintiffs, electricians, of 12, Camomile Street, E.C., against defendants, of Tudor Street, Temple, to recover £14 0s. 9d. for electrical work done.

According to the plaintiffs, in October last the defendants were anxious to install various arc lamps in their printing premises, and their traveller, who was now in South Africa, called on defendants for that purpose. Plaintiffs asked to be allowed to install certain flame arcs on approval; that was done, but soon afterwards complaints were made that the lamps were not working properly. Plaintiffs said that the resistances had been tampered with, and there was evidence of rough treatment on the part of defendants' men. They were kept for six months, and then defendants wanted to return them, but plaintiffs declined. The custom in the trade was that such goods should be returned within a month or paid for.

Mr. Marks explained that a little after a month from the date of fixing the lamps it was found that they were wholly unsatisfactory. Defendants asked plaintiffs to remove them.

Mr. Arthur Bergtheil said that defendants kept the lamps during the lighting season and then wanted to return them.

A suggestion was made that the complaints arose on the part of defendants' men because plaintiffs would not pay a bribe or commission to some of defendants' people; plaintiffs had never done anything of the sort.

Mr. Hosker, who had been managing director of defendant company, and Mr. Douglass, one of the present directors, said the lamps only remained on their premises as a favour to the plaintiffs. They were only received on approval, and the trial was unsatisfactory.

Judge Lumley Smith, K.C., said it was not a question of goods on sale or return, but of defendants allowing plaintiffs to put the lamps on the premises. Plaintiffs were not entitled to be paid for their lamps, but defendants must pay £1 7s. 6d. for some work which they had ordered. Judgement would be entered for £1 0s. 6d. for the plaintiffs beyond the sum of £2 15s. 3d., which had been paid into Court in respect of certain small items for carbons, &c.

BUSINESS NOTES.

Consular Notes. — Russia. — The British Consul at Batoum reports that copper mining in that district made but little progress in the direction of healthy development during the year 1908. It is reported that a new British company is about to start on a copper enterprise in the province of Batoum, but it has not yet actually set to work. The Caucasus Copper Co., Ltd., which started mining copper at Dzansoul about eight years ago, is still in difficulties with the large magnetic concentration plant which it has erected on its property in the Morgul valley, province of Batoum. The peculiarities of the ore prevent it from being treated by the magnetic process, and the Consul understands that the company has recently been compelled to revert to wet concentration. Experiments made a short time ago with the wilfley tables have furnished satisfactory results, and it is now proposed to add further plant of this description to the recently erected experimental machinery. According to the most recent statistical information to hand, it would appear that there were 14 copper mines and smelting works in the Caucasus during the year 1908, and although data as to their individual or combined output is lacking, to judge from figures relating to 1907 and 1906, it may be estimated that they produced close upon 7,000,000 pouds (112,903 tons) of ore, which yielded at a rough estimate nearly 300,000 pouds (4,838 tons) of copper. Besides the foregoing, 11 private copper enterprises are in existence in the Caucasus. The total combined output of these mines during the year 1908 was about 173,195 pouds (2,793 tons) of ore, which quantity was, however, not converted into copper in view of the absence of smelting works at these mines.

Later in his report the Consul states that the construction of an electric railway from Tiflis to Vladekavkaz, running where possible parallel to the Georgian military road, has been decided upon, and the scheme will be carried into execution as soon as the funds required for building it have been found. The Viceroy and all the more important authorities in the country, as well as a large portion of the population of the country through which the line is to pass, are applying for better means of communication in the locality. Although surveys in connection with the proposed electric railway from Tiflis to Kahetia have been completed for some time past, and the Georgian nobility of the locality have obtained a concession to build and exploit the line, yet the latter have hitherto been unable to procure the necessary funds for the enterprise. It is therefore surmised that much difficulty in finding the necessary capital for the realisation of the scheme is being experienced, which will probably considerably retard the commencement of the work.

The Vice-Consul at Poti reports that although the work of erecting an electric elevator for loading manganese ore into steamers has been completed for some time past, no attempt has yet been made to load manganese with it, and, according to all appearances, it is likely to continue its present idle career for an indefinite period.

The Vice-Consul at Baku reports that British machinery still maintains its name for the best and most reliable on the market, and firms already established have been doing good business in spite of the bad times. The great difficulty to contend with is that foreign competitors invariably give better terms of credit. The question of the immediate future of the oil field is economy in fuel; producers are now studying the possibilities of using natural gas for firing instead of crude oil as hitherto. A simple contrivance consisting of a centrifugal fan exhausting through

pipes connected to the wells is coming very much into use. In this manner the natural gas issuing from the well is collected and stored, being used either for firing boilers or in gas engines. There is a good opening for engines working on crude oil, and more especially for those working on natural gas.

Switzerland.—The Austrian Consul at Zurich reports that the Berner Alpenbahngesellschaft has given an order to Maschinenfabrik Oerlikon und Siemens-Schuckert Werke for the supply of three motor wagons and a locomotive, and for the installation of cables, &c., for the electric railway from Spiez to Frutigen. The Allgemeine Elektrizitäts Gesellschaft, of Berlin, are to supply a further locomotive. The system is to be the same as that installed by the Maschinenfabrik Oerlikon und Siemens-Schuckert Werke on the Seeback to Wettingen line. For the Spiez-Frutigen railway single-phase energy at 15,000 volts pressure will be supplied by the Vereinigte Kander und Hagnekwerke A G.; for this purpose plant will be installed in the electrical works at Spiez. The locomotives will be of 2,000 H.P., and will be capable of drawing a train of 310 tons at a speed of 42 km. per hour on a gradient of 27 per thousand, and a train of 500 tons at the same speed on a gradient of 15 per thousand. The greatest speed attainable will be 70 km. per hour. The work will be directed by Engineer L. Thorman, of Berne.

Aluminium Manufacture in Italy.—The Italian Aluminium Manufacturing Co. (Società Italiana per la Fabbricazione dele Alluminio) of Rome, which was first formed two years ago, closed its initial working year with a loss of £9,300 on a capital of £120,000. According to the directors' report, the company produced 600 tons of metal, of which two-thirds were sold, but the prices rapidly declined in consequence of the crisis in the metal market. The hope is expressed that the unfavourable condition of the market will soon pass away, as the low price of aluminium has stimulated its use as a substitute for other metals; and that under the protective duty the consumption in Italy will increase by the adoption of suitable measures. During 1908 the company had three banks of furnaces in operation, and as the fourth bank was started in January, 1909, it is expected that the plant will be fully utilised and the cost of production reduced.

Book Notices.—*Die Atmosphärische Elektrizität.* By H. Mache and E. V. Schweidler. Brunswick: Fried. Vieweg und Sohn. Price M. 6.—This is a thoroughly up-to-date account of the modern theories and methods of measurement connected with atmospheric electricity. The subject is still in a state of transition, but, as is pointed out by the writers, the marked advance in our knowledge of electric discharges in gases and the discovery of radio-active substances have placed the study of atmospheric electricity on quite a new basis within the last few years, and there is certainly room for a book of this nature, which attempts to co-ordinate the existing knowledge of the subject. The treatment is kept as simple as possible, so that others than experts will find much to interest them. The chapters on the ionic theory of gas discharges and on radio-activity, for instance, form an admirable introduction to the general study of electric theory from the modern point of view. The book is divided into seven chapters, dealing with the electric field or voltage gradient in the atmosphere, the conductivity of the air, the ions in the atmosphere, the sources of the ions, atmospheric currents, luminous discharges, and theories of atmospheric electricity. There is also a good bibliography of the subject, running to 11 pages.

Berechnung und Konstruktion Elektrischer Schaltapparate. By Prof. R. Edler. Hanover: Dr. Max Jänecke. Price M. 12.—This book is intended as a guide to students and young engineers in the design and construction of switchgear and allied apparatus. It contains a good deal of useful information and numerous clear diagrams, but many of the explanations are far from concise, and the critical comparison of the different practical solutions to a given problem is given quite insufficient prominence, although this is probably the most important part from the beginner's point of view. Some parts of the subject are dealt with at great length, without, however, attaining to any degree of clearness. Thus, in connection with the design of iron-clad electromagnets, whilst a great deal of space is given to the determination of the right size of wire, the important question of magnetic leakage is hardly touched upon. Again, in the chapter on automatic cut-outs, there is a great deal of descriptive matter illustrating existing types, but very little about the conditions to be met by these cut-outs, and the reasons for failure in practice. There are 11 chapters, including sections on low-tension switches, high-tension switches, fuses, automatic cut-outs, starting and regulating resistances and controllers, electromagnets for relays, &c., and battery switchgear. Many of the tables and curves should prove very useful to draughtsmen, especially if a more complete index were provided, so that they could be more readily referred to. A complete table of symbols should also be given, as a great many are used, and sometimes with two or more distinct meanings.

Die Normalen Eigenschafter Elektrischer Maschinen. By Dr. Rudolf Goldschmidt. Berlin: Julius Springer. Price M. 3.—The principal part of this little book is based on a paper read by Dr. Goldschmidt before the Institution of Electrical Engineers in 1908. It is intended as a guide to the designer and to the buyer as to reasonable standards of performance in present-day direct and alternating-current machinery, and fulfils this object very well. The printed matter is clear and concise, and is reduced to a minimum by confining it to mere statements with little or no explanation, so that the book is in no sense a text-book. At the same time, it contains many practical hints on performance which no text-book gives. A slight error occurs on p. 45, where the reciprocal of the constant for obtaining the input current of induction motors from the horse-power is given in place of the constant itself.

Reciprocating Steam Engines for Electrical Purposes.—Report No. 42 of the Engineering Standards Committee. London: Crosby Lockwood & Son. Price 2s. 6d. net.—This report is "intended to assist engineers and makers of steam engines for electrical purposes towards mutual understanding." It is hoped that engineers will incorporate in their specifications the clauses of the report, thus saving much time and trouble and benefiting all parties. The recommendations with regard to couplings will form a separate report, to be issued shortly. The present report fixes the full brake load of the steam engine at 110 per cent. of the rated load of the generator, and defines the latter on the basis of six hours' continuous run at full load, subject to the tests prescribed in Report No. 36. Steam pressures are standardised at 100, 150, 200 and 300 lb. per sq. in. (by gauge), and exhaust pressures at 15, 2·5 and 1·5 lb. per sq. in. absolute. A range of standard slow, medium and high speeds for generators of 30 to 1,000 KW. is given, and limits of cyclic and governing variations in speed are laid down. The overload requirement is that the engine shall drive the generator for two hours at 20 per cent. above its rated output without mechanical trouble, while its maximum economy shall be at such percentage of the rated output as may be specified by the purchaser. Lists are given of particulars which must be supplied to the manufacturer, who in turn, when quoting, must give the steam consumption in terms of the actual feed (lb. per B.H.P. per hour) and of the "equivalent feed" (obtained by multiplying the actual feed by the heat supplied to the admission steam, expressed in B.TH.U. per lb. of steam, and dividing by 1,100) at various outputs, the mechanical efficiency of the engine (B.H.P./I.H.P.), and the mean pressure referred to the low-pressure cylinder at the economical load and specified speed. In an appendix, the limiting values of the last-named item are given for various stated conditions.

Railway Rates. By the late Joseph Horrocks. London: Swan Sonnenschein. Price 21s.—This work relates to a new method of calculating equitable rates and charges for merchandise and other goods conveyed over the railway. As pointed out in the preface, the "method" is intended for use by the authorities and others interested in the railway rate question. In most respects the work adquately represents the experience of a thoroughly practical railway man who has passed his life in the service of the railways, and his spare time in studying how the existing railway rates could be made more equitable. The subject is at the present time a very interesting one in view of the fact that affairs in the railway world are at the moment in an unsettled state. Although the subject will appear rather intricate to the lay mind, it will be apparent to all that Mr. Horrocks's ideas if carried out would alter the existing methods of compiling railway rates, so that the system in vogue would be practically revolutionised. Whether Mr. Horrocks's system would benefit the public is an open question, and one that would have to be carefully investigated before a change was made in the existing conditions under which railway rates are calculated. It is acknowledged in business circles that railway rates require some adjustment, and the detailed information set forth by the author will provide the would-be reformer with plenty of food for reflection.

The first section particularises the duties and services with respect to conveyance rates for the transit of goods, and will be understood by all who are conversant with the present railway methods. Part 2 describes the compilation of the railway rates under Mr. Horrocks's system, and will be found interesting when compared with the present manner of compiling railway charges. Although Mr. Horrocks's system appears to be feasible, it is known that the railways have been generally successful and the public fairly satisfied under the present system, and the question naturally arises whether the views propounded by the author would be workable if carried into practical usage. Although it may be said that the method shown in this book is to a great extent equitable, at the same time the system described by Mr. Horrocks would require great amendment so as to give a fair rate for all kinds of traffic, and to compile fair rates one must consider all the local and special circumstances and conditions before one can venture to say that a rate is equitable. For instance, all import and export traffic requires different treatment to the ordinary cross-country carrying trade. However, the book may certainly be read by all who are at all interested in railways.

Train Lighting (Leitner System).—We have received from Mr. H. Leitner a copy of this exceptionally handsome book, in which are embodied a full description of the "Leitner" system of train lighting, critical notes, and a number of reports on the performance of the apparatus. The book is printed in two colours on thick paper, and is illustrated with excellent half-tone views and diagrams showing every part of the gear, separately and in position on board the train; a number of diagrams illustrating the connections of the various parts, and the results obtained under different conditions of running, are appended. The author explains the advantages of electric lighting for trains in comparison with all other means, and emphasises the great economy that has been made possible by the introduction of metallic-filament lamps. As we have fully described the system invented and patented by Mr. Leitner, we need only remark that it comprises, besides the indispensable battery and self-regulating dynamo, an automatic regulator which ensures the maintenance of constant voltage on the lamps, and prevents overcharging of the battery. This regulator has been gradually developed, until it now constitutes a complete self-contained unit, regulating the voltage within about 2 per cent. of the mean under all traffic conditions. The system possesses a very high efficiency at all working speeds—from 49 to 68 per cent. for the dynamo and belt, according to Mr. H. M. Sayers's tests—owing to the fact that a slipping belt is not employed; with the latter system, of course, there is a great loss of power at all train speeds above the slipping point. Mr. Leitner is to be congratulated

on the agreeable and attractive form in which he has embodied this record of the present high state of development of his invention.

Telegraphists' and Telephonists' Note-Book. London: S. Rentell and Co. Price 1s. 6d. net.—This is a handy little book containing useful notes, tables and formulæ such as are likely to be required for use in the everyday work of telegraph and telephone industries. It is written very much in the style of the "Practical Electricians' Pocket-Book," which is issued from the same office; that is to say, the dry facts are clothed with simple explanatory comments, and the actual amount of tabular matter is comparatively small. The various subjects common to almost all electrical industries are first dealt with, and afterwards the special features connected with means of communication are treated individually in greater detail. Measurement receives a considerable share of attention; in this connection the absence of reference to the universal shunt is a notable omission. Much of the matter relates to standard apparatus and methods employed in the Post Office, and has no general application, but in view of the fact that most of the telegraphs and telephones in this country are—or shortly will be—controlled entirely by that department, this can hardly be cavilled at. The book will, we have no doubt, be welcomed by those in a position to make use of its contents.

"Practical Alternating Currents." By C. F. Smith. Third Edition. Manchester: Scientific Publishing Co. 1909. Price 6s. net.

"Agenda de l'Electro, 1909." Brussels: "Electro." Price 3.50 fr.

Proceedings of the American Institute of Electrical Engineers. Vol. XXVIII. Nos. 4 and 5. April and May, 1909. New York: From the Institute. Price $1.00 per copy.

Electric-Pneumatic Signalling.—Messrs. McKenzie and Holland, Ltd., and the Westinghouse Power Signal Co., Ltd., have supplied the East Indian Railway with the necessary materials for this installation at the Howrah new station.—*Indian Engineering.*

Catalogues and Lists.—Mr. George Ellison, 17 and 18, Warstone Lane, Birmingham.—Illustrated circular describing automatic-release starting gear for A.C. motors.

Messrs. Hogan & Wardrop, Gloucester Mansions, Charing Cross Road, W.C.—26 pp. catalogue giving tabular information of sizes, weights, code-words and prices, with illustrations, of E M I electric fans for desk, bracket, ceiling, porthole and other service, also small power motors, automatic shutters, regulating resistances, grinding and polishing machines.

The Electrical Co., Ltd, 121/5, Charing Cross Road, W.C.—Illustrated price list of A.E.G. electric fans of desk, adjustable, ring and adjustable wall types for continuous and alternating current.

The British Central Electrical Co., 17, Hatton Garden, E.C.—Catalogue "F" (16 pp.) wherein full particulars, with illustrations and prices, appear of their "B.C.E." electric fans for table and desk use, fitted with two-speed regulator, swivel and and trunnion fans fitted with three-speed regulator, bracket fans with universal joint and three-speed regulator, automatic shutters for ring and porthole type fans, cabin fans, large ring and wall fans, starting and regulating rheostats, sewing machine motors, small industrial motors, &c.

Armorduct Manufacturing Co., Ltd., Farringdon Avenue, E.C.—Pamphlet C/963, just issued, giving illustrated information relating to several new types of conduit fittings that they are placing on the market. The illustrations of inspection fittings and junction boxes show that the covers of screw fittings are now of the heavy cast-iron direct screw-in type, securing a watertight joint and obviating the necessity for all screws. The oblong junction-boxes and draw-in boxes have been improved by being fitted with an inverted packing rim. The appearance of the lug-mounting fittings boxes has been improved by a considerable reduction in the over-all depth. A point of interest relates to the Armorduct Universal knock-out box, a further patent having now been granted by which the box is supplied tapped to a stop on every film; in this way the knock-out films are removed according to necessity, so that one box answers where five were previously required. These and other improvements embodied in the catalogue will no doubt be of interest to electrical contractors and the trade.

Messrs. H. W. Ward & Co., Ltd., Lionel Street, Birmingham.—New pocket catalogue (72 pages) of their machine tools. A number of extremely neat half-tone pictures, together with brief specifications, are given of boring machines, capstan lathes, chucking lathes, drilling and grinding machines, also milling and other machines. Copies can be obtained by any reader who is interested in the matter.

Messrs. H. & C. Grayson, Ltd., 21, Water Street, Liverpool.—Price list with specification and dimensional information relating to their standard petrol or paraffin stationary and marine engines, two and four-cycle, for coupling direct to dynamos or pumps.

Wilson-Wolf Engineering Co., Ltd., Thornton Road, Bradford.—Several new lists, one giving prices of the firm's "Arctic" propellor fans, and two others describing the "Sanco" petrol engine and dynamo sets, batteries, switchboards, &c., for country house lighting installations.

Messrs. Hamblet's Blue Brick Co., Ltd., Piercy Brick and Tile Works, West Bromwich.—Circular relating to the strength of their Staffordshire vitrified blue bricks, and giving a lengthy list of public and other authorities which have used them.

Messrs. Simplex Conduits, Ltd.—Two small booklets relating to their electric fittings and "Spookie" shades.

Messrs. Willans & Robinson, Ltd., Rugby.—A number of pages of a pamphlet they are issuing, describing the Willans vacuum turbine, intended primarily for use with exhaust steam.

Bankruptcy Proceedings.—Middleton & Co., electricians, 11A, King Street, Dover.—The statement of accounts under this failure shows gross liabilities amounting to £790; unsecured liabilities, £772; and no assets. "Want of capital and heavy expenses in conducting the business," are the causes of failure. The debtor, J. R. W. Middleton, started business at Dover between four and five years ago, and two years ago was joined in partnership by Alfred Daniels and Francis Balch, each paying into the concern £200. As his share was greater, it was arranged that he should have 13 per cent. of the gross profits, the balance to be equally divided between the three partners. The following are creditors:—

Boddy, G. M., & Co., Liverpool	£23
Chandler, G. W., Dover	26
Electrical Co., London	160
General Electric Co., Ltd., London	14
Jacobs, W. and R., London	34
Keiler, G., Dover	74
Simplex Conduits, Ltd., Brighton	37
Sun Electrical Co., London	16
Verey & Co., Dover	64
Wandsworth Electrical Co., Birmingham	14
Balch, F. W., Dover	224

George Sutcliffe, electrical engineer, Abertillery.—June 10th is the last day for the receipt of proofs for intended dividend by Mr. E. F. Gardner, official receiver, 144, Commercial Street, Newport, Mon.

J. G. S. Cunnington and H. P. Allison (Laing, Wharton and Cunnington, electrical engineers and contractors, 7, Great Newport Street, W.C.).—The first meeting of creditors was held on Tuesday. It was intimated that no proposal could be submitted, and resolutions were accordingly passed for the estate to be administered in bankruptcy, Mr. Page acting as trustee, with a committee of inspection as follows:—Mr. Snowden (the Receiver of the Improved Electric Supplies, Ltd.), Mr. C. T. Morris (Goossens, Pope & Co., Ltd., and Pope's Electric Lamp Co.), and Mr. Marshall (Union Electric Co., Ltd.). Our report of the details will appear next week.

Private Meeting.—A meeting of creditors of Vaughan and Cook, Ltd., electrical engineers, &c., 298, Goswell Road, E.C., was held on May 24th, in consequence of the company having gone into liquidation. The claims of the trade creditors amounted to £1,901, while Mrs. Cook was also a creditor for £2,000. The assets were set down at £3,393. The liquidator said that two creditors for £246 had taken proceedings, but application had been made to the Court for a postponement of any sale, pending the result of the meeting. For the year ended June, 1907, the trading showed a loss of £1,574, while during the following 12 months there was a loss of £1,144. Since last June there had been an apparent loss of something like £2,000. An offer had been received of £1,250 for the assets of the company. If that offer were accepted, Mrs. Cook would probably withdraw her claim of £2,000. There were, however, preference claims amounting to about £500, which would have to be discharged, and there would remain a sum of about £750 net for distribution amongst the trade creditors. It was decided that the offer of £1,250 for the assets should be accepted, and the appointment of the liquidator was also confirmed. The list of creditors will be published next week.

Dissolutions and Liquidations.—Auto-Controllers, Ltd.—A petition for winding up this company is to be heard at Poole on June 14th.

Harry W. Cox, Ltd. (the old company).—A meeting is to be held at 50, Gresham Street, E.C., on June 22nd, to hear an account of the winding up from the liquidator, Mr. A. R. King Farlow.

E.M.F. Manufacturing Co.—Messrs. E. H. Johnson, A. R. F. M. Reinhardt, R. Niepel, A. J. Grose and J. M. Bein have dissolved partnership. A notice concerning the new ownership of the business appeared in our pages on May 14th.

Remington, Ramsbottom & Bennett, electrical engineers, 22, Parsonage, Manchester.—Messrs. C. Remington, W. Ramsbottom and J. H. Bennett have dissolved partnership, Mr. Remington retiring. The other partners will attend to debts and continue the business as Ramsbottom & Bennett at the same address.

The Electro-Medical Co., electro-medical instrument makers, 12, Wigmore Street, W.—Messrs. W. G. Everingham, A. John and A. S. Lloyd have dissolved partnership. Messrs. John and Lloyd will attend to debts and continue the business.

Calcutt & Radburn, motor and electrical engineers, Watford.—The partnership subsisting between H. F. Calcutt and E. Radburn has been dissolved by order of the County Court.

The General Electric Sign and Engineering Co., Ltd.—This company is winding up voluntarily with Mr. Edwin Hayes, 28, Basinghall Street, E.C., as liquidator.

Amalgamated Radio-Telegraph Co., Ltd. — Creditors must send particulars of their debts, &c., to Messrs. F. W. Pixley and Herbert Allen, 58, Coleman Street, E.C., the liquidators, by July 6th.

Cornwall Electric Power Syndicate, Ltd. — A meeting is to be held at 3, London Wall Buildings, on June 29th, to hear an account of the winding up from the liquidator, Mr. J. A. Stoneham.

Trade Announcements.—Messrs. Vickers, Sons and Maxim, Ltd., inform us that in view of the growth of their electrical business, and for the convenience of their customers in London, they have appointed a representative at 28, Victoria Street, S.W. This branch of the business will be under the management of Mr. C. S. Thomson, M.Sc., M.I.E.E., who will deal with the large range of electrical machinery made at the Sheffield

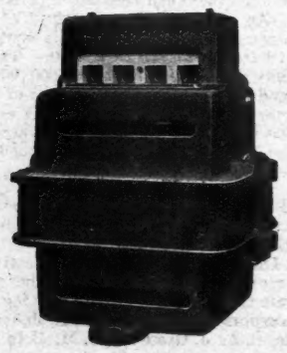
works, and also the smaller motors and generators manufactured by the Electric and Ordnance Accessories Co., at Birmingham, under the control of the Vickers Co.

The Electrical Industries Supply Co., of 2, Macdonald's Lane, Manchester, have received the agency for Mr. H. B. Brook, Granville Works, Tennant Street, Birmingham, for Manchester and district, for D.C. motors and box blade fans. We are asked to state that Mr. J. Pyecroft, late of the Metallic Seamless Tube Co., Birmingham, is now in their employ.

In connection with the change of proprietorship in the business of the Newall Engineering Co., the removal of the works and offices to Blackhorse Lane, Walthamstow, is now completed. The new factory is fully equipped and running, and all arrangements have been made for continuing, upon improved lines, the production of the Newall manufactures.

The Wilkinson Feed-Water Heater.—We are informed that the Comptroller of Patents has just given his decision in the matter of an opposition to the grant of a patent to Mr. George Wilkinson, of Harrogate, for improvements in the "Wilkinson" feed-water heater. There are a series of patents for this heater, but the present application, No. 1,777, of 1908, relates to means for regulating the amount of heat transferred from the steam to the feed water, it being recognised that there is a limit to the number of heat units which can economically be transferred from the steam in a boiler to the feed water brought into contact therewith. The grant of the patent was opposed by Messrs. Hamilton & McMasters, of Central Engine Works, Belfast, on the ground that the invention had been patented under their prior patent No. 21,070, of 1900, and also upon the ground that the manner in which Mr. Wilkinson's invention was to be performed was not sufficiently or fairly described and ascertained in his complete specification. The matter was argued at a hearing before the Comptroller, at which the applicant was represented by Messrs. Tasker & Crossley, patent agents, Halifax, and the opponents by Messrs. Marks & Clerk, of London. The opposition was dismissed, with seven guineas costs against the opponent.

Auto-Transformers.—The Brockie-Pell Arc Lamp Co., of Wimbledon, is now putting on the market a later type of auto-transformer for use with metallic-filament lamps. The connections of the transformer are made in a porcelain chamber at the top of the transformer, this chamber being protected and covered in by a cast-iron cap attached by screws to the transformer case. This chamber is readily accessible by the removal of two screws, and the transformer windings are enclosed in a well-ventilated



cast-iron cover, the core forming the completion of the case, as shown. The firm claims for this transformer a high efficiency, good voltage regulation, and cool running. The porcelain chamber enables the connecting up to be simply and quickly carried out. We understand that the firm is supplying large numbers of these transformers, and is also making single and multi-phase transformers of large capacity for general distribution.

For Sale.—On June 15th Messrs. Fortt, Hatt & Billings will sell by auction the electrical engineering plant and stock of the Locksbrook Engineering Works (Kramos, Ltd.).

The Dundee Corporation Electricity Department is offering certain Lancashire boilers and continuous-current generating plant for sale. See our advertisement pages to-day.

LIGHTING and POWER NOTES.

Acton.—The Council, at its last meeting, further discussed the proposal to dispose of the electricity undertaking to the Metropolitan Electricity Supply Co., Ltd., for a lease of 37 or more years, also the alternative of raising the charges for current for lighting purposes. The accountant presented a return showing what charges it would be necessary to impose in order to prevent the concern making any call upon the rates, and Councillor Hunt brought forward a motion for increasing the charge to 7d. per unit for consumers with free-wiring installations, and 5d. for all other consumers. The present charges are 4d. for shops and public buildings, and 5d. for all other consumers. This, together with the acceptance of the revised terms of the company of November 3rd last, was agreed to by 8 votes to 5, and it is estimated that the deficiency of £3,600 will be reduced to £1,035 as a result. Under the revised terms, the company will, during the years 1909 and 1910, accept payment for all energy supplied at the rate of £5 per KW. per annum, of the maximum demand in each year, plus one-third of a penny per unit, provided that electricity be again used for street lighting to the extent of not less than 110,000 units per annum, and the total payment to be made to be not less than £4,200 per annum.

Ashton-under-Lyne.—The T.C. has applied to the L.G.B. for a loan of £48,424 for the extension of the generating station and the plant.

Bargoed.—The Rhymney Valley Electric Co. has installed distribution mains in the town; energy is being obtained from the Powell Duffryn Co.'s colliery installation.

Barnsley.—The annual report on the Council's electricity undertaking shows an output of 1,432,394 units. The gross profit amounted to £6,670, and the net profit to £1,429, from which £1,000 has been voted to the rates, the balance going to reserve.

Bedford.—The T.C. has decided to convert 58 gas lamps to electric at a capital cost of £630. The candle-power will be increased from 928 to 3,840, and the annual cost will be £150 15s., against £143 for gas.

Bray.—Mr. A. D. Price, engineering inspector to the L.G.B., held a sworn inquiry on the 20th inst. into an application made by the Urban Council for the Board's sanction of a loan of £2,600 required for the electric lighting purposes. The application was opposed by Councillor T. Picton Bradshaw, who was legally represented, on the grounds that the Council was not charging the full price of 8d. per unit for the electric light, which it was bound to charge until the system paid, and that the loan applied for was already included in the rates for the current financial year and in the rates of the past one. Various witnesses having been heard, the inquiry adjourned.

Brazil.—Recently the City of S. Paulo has been much exercised over electric lighting matters. The concession for the city is held by the S. Paulo Tramway, Light and Power Co.—a Canadian concern—but recently a local syndicate under Messrs. Goffrée & Guinle, who have recently erected a power plant to supply Santos, applied for leave to carry a line to S. Paulo with a view to competing with the concessionary company. There was some uncertainty as to the attitude of the city authorities, but we understand that they have now confirmed the exclusive rights of the Canadian concern to the streets occupied by its line.

Burton-on-Trent.—The churchwardens of the local church of St. Peter's have reported that the electricity bill for two quarters amounted to £3 10s. 8d., as against £13 7s. 7d. for gas in the corresponding quarters of the previous year. The installation consists of 75 25-C.P. Osram lamps, and the meter readings have been checked by a test meter.

Continental Notes.—Italy.—The municipal authorities of Naples have secured a concession to put down a plant to utilise the water-power of the River Volturno in the generation of electrical energy for power purposes.

Bosnia.—The municipal authorities of Sarajevo have decided to put down a plant to utilise the water-power of the River Zeljeznica in the generation of electrical energy for electric lighting and power purposes in the city.

France.—La Société d'Eclairage et de Force Motrice par l'Electricité de St. Julian de Sault is the name of a company which has just been formed in Paris with a capital of £40,000.

Croydon.—The accounts of the electricity department came before the B.C. on Monday, along with the report of the professional auditors, and all were regarded as satisfactory. The electrical engineer pointed out that consumers had benefited by £3,584, as a result of the reductions of price made last summer. The estimated loss of revenue by the growing use of metal-filament lamps was £2,000. On the revenue account the total expenditure was £34,975, an increase of £3,842; the total receipts were £64,650, a decrease of £2,287. Allowing for the reduction in charges and economies of the metal-filament lamps, these results were viewed as satisfactory. There was a decrease of 1·44 per cent. in efficiency of distribution, accounted for by the adoption of metal-filament lamps with auto-transformers and a large number of the older type meters failing to record small amounts. The total amount standing to the credit of the reserve fund is now £34,578. The Lighting Committee recommended that the balance of the net revenue account, £9,443, should be appropriated (1) for street lighting and distribution renewals, £3,500; (2) balance to be carried forward, £5,943. The Committee also recommended that from June 30th next the flat rate for current supplied should be reduced from 4½d. to 4d. per unit; further, that from the same date street arc lighting should be reduced from £16 to £15 per lamp per annum.

Devonport.—Estimates are being prepared by the electrical department of Devonport Dockyard for the lighting of the Royal Victualling Yard, Stonehouse, the only principal Admiralty establishment in this locality not yet equipped with an electrical installation; the Devonport Corporation will supply energy.

Dundee.—It is stated that there is now every prospect of the new generating station being able to take on its load in July. The H.T. switchgear is finished. The sub-station at Clepington is ready for working, but that at Lochee is in arrear, the buildings being scarcely finished. At Dudhope Crescent the work of establishing a sub-station for the central area is being pushed forward.

Egham.—The U.D.C. has given formal sanction to the Egham Electric Light Co. to include in the provisional order a dusk-to-dawn supply at a uniform rate of 10s. per lamp.

Exeter.—The electricity revenue for the year ended March 31st was £18,486, and the gross profit £9,405. Interest and sinking fund, with income-tax, absorbed £7,335, leaving a net disposable surplus of £2,070. This, added to the reserve, brings that fund up to £5,127. Although the business is prospering and increasing, the outlook is made somewhat anxious by the introduction of metallic-filament lamps. Already the introduction of metal-filament lamps has made the revenue stationary. Under former conditions the installation increased about 10 per cent. annually, and the consumption of current and revenue increased in ratio. Now, however, there is still the 10 per cent. increased installation annually, but the revenue does not increase.

Falkirk.—A lengthy discussion recently took place on the proposal to appoint a special committee to deal with the question of electricity supply, negotiations having lately been opened with the Scottish Central Power Co. Eventually the special committee was appointed.

Gillingham (Kent).—The T.C. has decided to apply for a loan of £3,000 for the installation of a 120 or 140-KW. Diesel oil engine at the electricity works. The Council has also decided to let out low-voltage transformers at 1s. per quarter up to a capacity of 500 watts, and at 1s. 6d. per quarter from 500 to 1,000 watts.

Guernsey.—From the designs of Edinburgh engineers, a lighthouse is being erected at Guernsey. The novel feature about this building is that a submarine cable is laid to the keeper's house on shore, 1¼ mile distant. This has been rendered necessary, owing to the area of rock being insufficient to erect a lighthouse with keeper's accommodation. The powerful fog signal will, therefore, be worked by electricity from the shore. By this summer it will be in order, and at present the motors, pumps, &c., are being fixed up.

Hanley.—With respect to the proposal of the T.C. to supply electricity to the Milton district, the North-Western Electricity and Power Gas Co., of Manchester, has informed the Council that it possesses certain powers in the area referred to, and is taking steps to supply power within the district.

Hastings.—The T.C. decided at last Friday's meeting to fit 150 gas lamps in the centre part of the town for electric light, the cost to be met out of current rate. Recently the L.G.B. declined to sanction a loan to enable the transformation of 700 gas lamps. In the course of the discussion Councillor Dr. Gray (who is chairman of the Gas Co.) described the proposal as "most scandalous," and declared it was "a juggle" to contend that electric light would not cost more than gas. By 22 votes to 4 the proposal was carried.

Hereford.—A L.G.B. inquiry was held on May 18th into the application of the T.C. for a loan of £8,000, £5,700 being for mains and the balance for excess expenditure. There was no opposition.

India.—A scheme for the electric lighting of Shillong has been adopted; power will be developed at a local waterfall, and the streets, private residences and Government offices will be illuminated.

A hydro-electrical scheme is being undertaken in the native state of Patalia, which is estimated to cost 10½ lakhs, and will shortly be completed.

Lancaster.—The returns of the electricity department for the year 1908-9 show that 765,450 units were sold, some 250,000 being for traction purposes. The total revenue amounted to £9,645, and the net revenue to £3,975, which sufficed to meet interest and sinking-fund charges and leave a balance of £711. From the latter £700 was voted to the district fund.

London.—HAMPSTEAD.—At the last meeting of the B.C. a discussion arose upon a statement showing that the income of the electricity undertaking for the year ended Lady Day, 1909, was £62,878, as against £65,738 in the previous 12 months. It was explained that the reduction was almost entirely due to the introduction of metallic-filament lamps.

FULHAM.—For the 12 months ended March 31st last there was a surplus on working the electricity undertaking of £3,573, as against £1,408 in the previous year. From the first-named amount, however, there must be deducted, in accordance with the requirements of the District Auditor, the accrued proportions of principal and interest from the date of last payment to March 31st, 1909, although such payments are not made until some considerable time latter. These accrued proportions amount to £1,695, leaving a net surplus of £1,914, to which should be added £408 (the balance of last year's surplus after transferring from same £1,000 to the reserve fund). The Electricity and the Finance Committee have agreed as to the advisability of transferring £2,000 of the available surplus this year to the machinery maintenance and reserve fund, bringing the credit balance of this account up to £5,068.

ISLINGTON.—At the meeting on May 21st of the B.C., a letter was received from the Great Northern and City Railway Co., suggesting that as the company's generating station was only half loaded at present, an arrangement might be come to between the Council and the company for the supply by the latter of energy in bulk. It was resolved to refer the communication to the Lighting Committee.

HACKNEY.—The Electricity Committee reports having instructed the electricial engineer to prepare a scheme or schemes for supplying the Borough of Bethnal Green with energy. The schemes are to be received not later than the 31st inst., and they must be such as will meet with the approval of the B. of T. The Committee further reports that important developments are taking place in the power business in Hackney Wick district, and it is a question whether it will be able to get through next winter satisfactorily without adding to the feeder system of the district.

MARYLEBONE.—The B.C. has entered into a joint arrangement with the Central Electric Supply Co. in regard to the use of the canal for condensing purposes. It has been further agreed to proceed with the conversion of all the 1,964 street lamps to electric lighting, as originally proposed, paying for the work out of revenue during the next three years.

The experimental conversion of the street lighting in Harley Street has proved very satisfactory, and on the basis of its cost the whole work can be carried out for £7,000, as compared with £8,000 originally estimated.

Malvern.—The U.D.C. has decided to support the proposed clause in the E.L. Amendment Bill preventing any other person from distributing or supplying electricity where a public authority owns the E.L. undertaking.

Navan.—The B. of G. recently decided to install electric lighting in the workhouse. A suggestion was made that the local Council would be able to supply the building, if the Board waited, but it was pointed out that the Council had spent over 10 years in discussing the matter, and had only now obtained a provisional order.

Norwich.—The report on the year's working of the Electrical Department shows an output of 4,166,000 units, as against 3,361,000 in the previous 12 months. The income was £37,188, and £18,142 was carried to the revenue account. After meeting all charges a balance of £1,200 remained, which was allocated to relief of rates. The Chairman, in submitting the report, said the conviction had been forced upon the Committee that the apathy of the citizens was due to disappointment at not having participated in any profits from the undertaking, and in consequence the Committee had decided to offer the city this £1,200. He further pointed out that there were at least 20,000 houses in the city which might receive a supply, but only 4,400 did so. The discussion on the report was adjourned for a month.

TRAMWAY and RAILWAY NOTES.

Argentine.—The Central Argentine Railway, which, owing to its amalgamation with the Rosario line, carries more passengers in and out of Buenos Ayres than any other company, has asked Mr. Chas. H. Merz to report on the electrification of the suburban lines. It is understood that there is a chance of a comprehensive scheme being drawn up to embrace all the local and suburban lines of the various companies.

Black Country.—The Tramways Committee of the Rowley Regis U.D.C. has now consented to another joint conference with the Quarry Bank and Brierley Hill Councils, for the purpose of discussing the negotiations for the construction of a light railway from Cradley Heath to Brierley Hill, and to settle, if possible, the deadlock which has arisen. This decision was arrived at on Monday at the monthly meeting of the U.D.C.

China.—La Compagnie Française de Tramways et d'Eclairage Electriques de Shanghai has now 17½ km. of electric tramways at work, of which 4 km. are double track. The report for last year also states that there has been a satisfactory increase in the demand for energy for lighting purposes.

Darlington.—The T.C. has applied to the B. of T. for an extension of three years from July 24th next for the construction of the tramway known as the Haughton line.

Exeter.—The tramway accounts for the past year show a revenue of £15,873; working expenses amounted to £10,914, and, after meeting financial charges, there was a deficiency of £131.

Hastings.—In consequence of complaints as to the state of the tramway track, the T.C. has decided to serve notice on the company that the borough engineer will carry out the necessary repairs at the company's expense after due notice.

Lancaster.—The Corporation tramways do not prove so satisfactory as the electricity department. The system is only a short one of about 4 miles, mostly single track, and it earned 7·58d. per car-mile. Working expenses, however, amounted to 8·22d. per c.m., and financial charges to a further 4·2d., obviously involving a considerable loss on the year's working. During the year 158,792 car-miles were run, and 1,301,886 passengers carried; the loss during the year was £3,235.

Leeds.—The deputation of the T.C., which recently visited the Continent with a view to inspecting the trackless trolley system in Vienna, Milan and Mulhausen, has reported favourably, and is to make certain recommendations as to experiments to the T.C. shortly. The list of municipal deputations who have enjoyed this fashionable tour is already a lengthy one, and others on the look-out for a pleasant little outing are advised to make up their minds quickly.

London.—Some excitement was caused at the Charing Cross Station of the District Railway on Monday night, by a fire which occurred under a motor-coach. The fire was extinguished by the railway staff, who also piloted the passengers from trains held up in the tunnels.

L.C.C.—£2,690 is to be expended on the provision of additional sand-crushing apparatus and office accommodation at the Greenwich Road permanent way tramways depôt, and the construction of tramway tracks leading into the depôt.

The Highways Committee, in a report, states that the total capital expended on tramways to March 31st last was £9,484,000, leaving approximately £3,250,000 for future expenditure. Estimates for 1909-10 show an expenditure of £1,800,000, this including £200,000 in respect of purchase and construction of tramways for which powers are being sought.

Salford.—There was a gross profit of £87,585 on the working of the tramways during the past year; £26,667 has been paid to local authorities for rent of lines, &c., and £43,694 for interest and sinking fund, leaving a net profit of £17,224. The profit is less than that earned last year, due in a measure to severe trade depression.

South Anglesey.—Application has been made to the Light Railway Commissioners by a local company at Carnarvon, for an order to construct a light railway from Newborough to Gaerwen, with a terminus upon the shores of the Menai Straits.

TELEGRAPH and TELEPHONE NOTES.

Hull.—The accounts of the Corporation Telephone Committee for the past year show that after paying interest and sinking fund and maintenance charges there remained a balance of £2,122, of which £1,082 has been paid to the Postmaster-General, leaving a net profit of £1,040. The net increase of subscribers during the year was 235.

Telegraphic Interruptions:—

Jamaica-Colon	... May 6, 1909
Dakar-Conakry	... May 13, 1909
Tangier-Cadiz	... May 19, 1909

Wireless Telegraphy.—It is reported from Berlin that the Telefunken Co. has devised a system of wireless telegraphy in which the signals are received as pure musical tones, which can be heard even when very faint.

CONTRACTS OPEN and CLOSED.

OPEN.

Aberdare.—June 7th. Electrical goods for the Powell Duffryn Steam Coal Co., Ltd.; Stores manager, Aberaman offices, near Aberdare.

Australia.—Victoria.—50 coin attachments for the P.M.G. See "Official Notices" May 7th.

Victoria.—Eight sections of common-battery switchboard and subscribers' apparatus for Hawthorn Exchange. See "Official Notices" May 7th.

Melbourne.—July 14th. One direct-current steam-driven generating set of 1,000, 1,250 or 1,500 kw., for the Council. See "Official Notices" May 14th.

Melbourne.—June 1st. 69,750 incandescent lamps for the Council. See "Official Notices" May 14th.

Melbourne.—150 relays, non-polar, for the Postmaster-General. See "Official Notices" to-day.

Queensland.—Telephone material for the P.M.G.'s department. See "Official Notices" May 7th.

New South Wales.—One photometer, &c., for the P.M.G.'s department; also a branching multiple magneto switchboard. See two "Official Notices" May 14th.

Cape Town.—June 16th. According to the *Standard*, the Corporation is inviting tenders for the supply of 450 tubular steel electric light poles, 8 transformer pillars and two 10-kw. transformers, 700 double-channel steel cross-arms, and 110 street lamp fittings. Tenders to Messrs. Davis & Soper, 54, St. Mary Axe, London, E.C., from whom specifications may be obtained.

Carlisle.—June 14th. Stokers, superheaters, 300-kw. mixed pressure steam turbo-generator (d.c.), for the Electricity Department. See "Official Notices" to-day.

Cleckheaton.—June 3rd. Coal (1,200 tons slack, 600 tons engine) for the U.D.C. electricity works. J. H. Linfield, Clerk, Town Hall.

Dudley.—June 10th. A motor-generator with switchgear, for the Corporation. See "Official Notices" May 21st.

June 10th.—Traction battery and automatic booster, with switchgear, for the Corporation. See "Official Notices" to-day.

Glasgow.—May 29th. Electrical and other stores, for the Trustees of the Clyde Navigation. Apply to the Superintendent of Stores, 16, Robertson Street, Glasgow.

The T.C. Committee on Libraries has authorised the Sub-Committee on Sites and Buildings in conjunction with Mr A. B. M'Donald, city engineer, to prepare the specification and scheme for the electric lighting of the new Mitchell Library, and issue the same to contractors. The Committee has power to accept the best offer.

Grimsby.—June 7th. Two superheaters for Stirling boilers, also renewal of dripping bars in existing cooling towers, for the Corporation. See "Official Notices" May 21st.

Hornsey.—May 28th. Cables for the T.C. See "Official Notices" May 14th.

Ilford.—June 7th. Construction and alteration of about 480 lineal yards of tramway permanent way, for the U.D.C. (deposit £2 2s.); H. Shaw, engineer and surveyor to the U.D.C.

Italy.—Rome.—The municipal authorities are about to invite tenders for the concession for the construction and working of two new lines of electric tramways in the city.

Leigh.—June 11th. The Leigh and Atherton Joint Sewerage Board is inviting tenders for additional sewage disposal works at Mather Lane, Leigh, Lancs. "Contract No. 4: High-speed vertical steam engines and dynamos, motors, cables, and electric lighting." Deposit for the section one guinea, to Messrs. Banks, Fairclough & Stephen, engineers, Leigh.

London.—St. Pancras.—July 10th. Arc lamp carbons for the B.C. See "Official Notices" April 30th.

L.C.C.—June 15th. 200 double-deck roof-covered car bodies, 200 car sets of maximum-traction swing bolster trucks, and 200 complete electrical equipments for operation upon both conduit and overhead trolley systems. See "Official Notices" May 14th.

Manchester.—May 29th. Various stores for the Electricity Department. Mr. F. E. Hughes, secretary to the department.

June 16th.—Electric light installation for the Guardians' offices in New Bridge Street. Specification (deposit one guinea) from Mr. J. Macdonald, Clerk.

Mexborough.—June 8th. 100-kw. engine and generator, switchboard extensions, piping, and water purifier and softener for the U.D.C. electricity works. See "Official Notices" May 7th.

Penrhiwceiber (Glam.).—June 25th. Electrical fittings for a year, for the Penrikyber Navigation Colliery Co., Ltd.; the Secretary.

Sculcoates.—June 9th. 15-kw. d.c. dynamo, driven by steam turbine or high-speed engine, for the Guardians. See "Official Notices" to-day.

Southampton.—Sundry heavy cables for low-tension trunk mains for the electricity department. See "Official Notices" May 21st.

South Shields.—June 14th. Stores for the Corporation Tramways Department. See "Official Notices" to-day.

Tunbridge Wells.—June 12th. High and low-tension cables for the Corporation. See "Official Notices" to-day.

Warrington.—June 2nd. Cables, motors and transformers for the electricity department. See "Official Notices" May 21st.

CLOSED.

Gloucestershire.—Messrs. Sanders & Co., of Cheltenham, have received an order to install a complete electric lighting plant, comprising oil engine and dynamo, storage battery, underground

cable, &c., at "The Place," Icomb, one of the oldest country residences in Gloucestershire, for Mr. G. Simpson-Hayward, the Worcestershire cricketer. "The Place" was originally a monastery or priory.

Glasgow.—The Electricity Committee recommends the acceptance of the following:—

Low-tension cables.—Callender's Cable Co.
High-tension cables.—W. T. Glover & Co.
Rubber-covered cables.—Craigpark Electric Cable Co.
Meters.—Chamberlain & Hookham, Ltd., Ferranti, Ltd., and British Thomson-Houston Co.
Carbons.—Sloan Electrical Co.
Malleable-iron tubes and fittings.—Stewarts & Lloyds, Ltd.

Hastings.—The T.C. on Friday accepted the following tenders:—

General Electric Co.—60-watt Osram lamps, £47 10s.
W. Lucy & Co., Oxford.—Brackets complete with lanterns, reflectors, pear-shaped glasses, and large and small joint boxes, £159.
W. T. Glover & Co.—7/21 concentric cable, £71 10s.
Doulton & Co.—Troughing, bricks and insulators, £41.
Cowans, Ltd.—Joint-boxes.

London.—L.C.C.—The Highways Committee recommended an expenditure not exceeding £30,000 in respect of the reconstruction, on the underground conduit system of electric traction, of the tramways from Cambridge Road *via* Mile-End Road to Burdett Road, and the alterations required to the trackwork between Burdett Road and Bow Bridge for the overhead trolley system of electric traction. They further recommend that, subject to the approval of the Board of Trade being obtained and to satisfactory arrangements being made with the local authority concerned, the Highways Committee be authorised to arrange for the execution of the roadwork and platelaying for the reconstruction of the tramways to be carried out by Dick, Kerr & Co., Ltd., as an extra on the contract entered into with them under the resolution of December 15th-16th, 1908, in respect of the roadwork and platelaying in connection with the reconstruction of the Hackney Road to Stamford Hill, &c., tramways, subject to a reduction of 2s. 6d. a ton for iron castings. Tenders were obtained from selected firms for the supply of the overhead electrical equipment required in connection with the reconstruction, on the overhead trolley system of electric traction, of the tramways in Bow Road between Burdett Road and Bow Bridge, and for the line to the Bow tramways car-shed. Four firms were invited to tender, but one of them, the British Thomson-Houston Co., Ltd., was unable to do so. The amounts of the tenders received are as follows:—

Dick, Kerr & Co., Ltd. .. .. .. (recommended)	£2,511
British Insulated and Helsby Cables, Ltd...	2,613
R. W. Blackwell & Co., Ltd.	2,666

Estimate of chief officer, £2,500.

The Council has placed a contract with Reid Bros. for laying further stoneware cable-ducts in connection with the electrification of the tramways between St. George's Circus and Blackfriars and Westminster Bridges. The tender of Geo. Skey & Co., Ltd., for 15,000 stoneware cable-ducts at £9 per 1,000, has also been accepted.

Messrs. G. Hayward & Co., Ltd., are to supply 78 movable platforms, with necessary rails, &c., for cleaning electric cars at the Hackney tramways car-shed.

The Council has placed a contract with Messrs. A. Hawkins and Sons, at £180, for the electric lighting of the St. John's Hill divisional offices.

The contract for the electric lighting, telephones, bells and fire alarms, for the City of London Union Infirmary, Homerton, N.E., has been placed with Messrs. Lund Bros. & Co.

The Davis Electrical Co., Ltd., have recently secured a contract from the London United Tramways, Ltd.

Battersea.—The E.L. Committee has accepted the offer of Callender's Cable Co. to purchase old scrap metal at the central station, at £1 17s. 10d. per ton for iron (18 tons), £2 14s. per cwt. for copper (10 cwt.), and £1 13s. 6d. per cwt. for brass.

Marylebone.—The B.C. has accepted the tender of Mr. Haydn Harrison for 1,906 twin-lamp lanterns and 23 triple lanterns for the conversion of street lamps to electric lighting. Fittings for twin-lamp lanterns 12s. 3d. each, fixing on site 3s. 6d.; fittings for triple-lamp lanterns 16s. each, fixing on site 4s.; wooden rods for turning on and off, 1s. each; spare parts, complete switch in chamber, 5s. 6d.; sealing chambers, 1s. 9d.; reflectors, two-light 3s. 9d., three-light 6s. 6d.; enclosed fuse-carriers, 4d. each.

Morecambe.—The Bradford Electrical Engineering Co., Ltd., has received an order for a complete electric light installation at Morecambe Tower and Casino, the installation includes 2,000 lights, arc lamps, mains switchboards, &c. The firm have also in hand an order for the electric lighting of 40 private houses.

Mysore.—Messrs. Reavell & Co., Ltd., have secured an order from the Mysore Gold Mining Co. for a large two-stage air compressor of their direct-coupled type, to be driven by a three-phase motor of 200 H.P. Messrs. Reavell are very busy at the present time with a number of important compressor contracts largely for mining work at home and abroad.

Southend-on-Sea.—The T.C. has accepted the tender of Hadfield's Steel Foundry Co., Ltd., for 24 steel tires for tramcar pony wheels, at 22s. 6d. each; and that of Callender's Cable and Construction Co., Ltd., for single conductor cables.

FORTHCOMING EVENTS.

Institution of Mining Engineers.—Friday, May 28th. Visit to the works of the India-Rubber, Gutta-Percha and Telegraph Works Co. Meet at Fenchurch Street Station (G.E.R.) at 3.5 p.m.

Roentgen Society.—Thursday, June 3rd. At 8.15 p.m. At 20, Hanover Square, W. Annual general meeting. Demonstration of the new "Snook" Roentgen apparatus by Mr. R. S. Wright.

Royal Institution.—Thursday, June 3rd. At 3 p.m. Lecture on "A Modern Railway Problem: Steam *v.* Electricity," by Prof. W. E. Dalby. (Lecture I.)

Friday, June 4th.—At 9 p.m. Discourse on "Researches in Radio telegraphy," by Prof. J. A. Fleming.

NOTES.

The Electrical Industry and the "Daily Express."—Since our leader pages went to press, the *Daily Express* edition of Thursday has appeared. That paper still does not advance any arguments of its own by way of reply to our criticisms—apparently the writer of the original article has none to make. Instead thereof, it appears to have turned its editorial steps hurriedly to Queen Victoria Street, whence many Tariff Reform preachments have issued, and has secured from Mr. Hugo Hirst, of the General Electric Co., Ltd., a letter on the general subject of Tariff Reform. We note that Mr. Hirst, like the *Express*, ignores the points we raise, and we will charitably assume that he has not seen the advance copy of our to-day's leading article; we will *not* believe that Mr. Hirst, ardent Tariff Reformer as he is, will approve of the most misleading calculations that appeared in the *Express* of Friday last. The question at issue at the moment is not whether the electrical trade stands to benefit or to lose from Protection, nor what this, that, or the other firm may think of the Electrical Review and its policy, or what any particular individual may think is the view of the rest of the members of the industry. The *Daily Express* set out to prove a certain thing, it got together a certain amount of information, and used part of it to enable it to make the deductions it desired. We showed these calculations to be absurd, and the plain facts of the matter can be seen in our leader pages to-day.

National Telephone Dinner.—On Thursday last week the fifteenth annual dinner of the National Telephone Co., Ltd., was held at the Trocadero, Mr. Albert Anns, the secretary, in the chair. There were many distinguished visitors, including Sir H. B. Smith, Sir John Gavey, Sir R. Hunter and Major O'Meara, and the usual gathering of some 270 of the chief officials of the company's staff, which numbers upwards of 17,600 members.

After the loyal toasts, the chairman proposed "The National Telephone Co." He remarked that progress had not been so rapid as in previous years, owing to the necessary limitation of capital expenditure. In autumn last year they found themselves face to face with the problem of keeping on their large staff without work for them to do; rather than part with a loyal and efficient constructional staff, the directors hurried on work that would otherwise not have been done in the winter. He hoped that arrangements would be made to prevent the infliction of wholly unmerited disaster on these men. During the year 88 new exchanges had been opened, and 27,576 stations added. Thanks to the support of the P.M.G., the unexpected opposition to the measured-rate system had been overcome, and the telephones saved to the nation as a commercial asset; he estimated the value of the company's business as at least 20 millions sterling. He confidently hoped that the staff would receive fair treatment all round at the transfer, because the P.M.G. had shown himself most solicitous for the welfare of the employés of the Post Office, and the House of Commons never sanctioned an agreement known to be unjust. Replying to the toast, Mr. G. Franklin, the president of the company, stated that the gross revenue to March 31st last was £3,081,581, and the royalty paid to the P.M.G. was £283,758, making a total in royalties since the commencement of £2,829,528. Last year there were 1,555 exchanges at work, and 1,323 million messages were handled—an increase of 9 millions over the previous year; each message cost, on the average, 0·49d. As the result of tests, it was found that in the London district the average time from calling exchange to receiving "Number, please?" was 4·7 seconds; to being put through, 38 seconds. In the provinces it took from 22 to 45 seconds to obtain connection. Of the line plant, the underground wires now constituted 71·3 per cent. of the total mileage. Central battery exchanges numbered 26·6 per cent. of the total, 6 had been opened since January 1st, and 26 more were in hand. There was one station to every 78 persons in Great Britain, as compared with 1:137 in 1903. The measured rate had become practically universal. Mr. Franklin concluded by asking the staff to have confidence in their directors, who would do their best to secure just and liberal treatment for them.

Mr. W. E. Hart proposed "Our Guests," and Sir H. Babington-Smith, in responding, paid a tribute of respect to the late general manager, Mr. Gaine, to whom so much of the prosperity of the

of the company was due. He referred to the suggestions recently made that the transfer might be hastened, and assured the staff of a hearty welcome when they joined the staff of the Post Office; they would certainly not meet with unjust or inequitable treatment. Mr. W. A. Smith also replied, remarking that he and Mr. Sands were the only remaining directors of the original company, and referring to the first gathering in Glasow 28 years ago. Mr. Frank Gill, in proposing "Engineering," pointed out the great number of engineering problems met with in the telephone industry. A great deal of research work had been carried out, he said, in connection with the very weak high-frequency currents employed in telephony, requiring the development of special apparatus and methods of precision. They were deeply indebted to Mr. Duddell for his oscillograph, which was in constant use recording waves of a frequency of 3,000. Sixteen million conversations carried on simultaneously represented a consumption of energy no greater than that of one 16-c.p. lamp; but the cost of that energy was about £16,400 per unit. The world's telephones numbered about 10 millions, and the capital invested was about 350 million pounds; there were 14,000 million calls per annum. The telephone industry in this country was most fortunate in the clear-sighted recognition by the directors of the vital importance of sound engineering to the business. Mr. W. M. Mordey replied, recalling his early construction of a telephone in the seventies, and his having acted as assistant to Graham Bell when he lectured in this country. He insisted on the dependence of the light and heavy sides of engineering upon each other, and pointed out that recent improvements in the magnetic qualities of iron for heavy work were of distinct benefit also to telephony. The proceedings closed with a vote of thanks to the chairman.

Institution and Lecture Notes.—Royal Institution.—On June 3rd Prof W. E. Dalby commences a course of two lectures on "A Modern Railway Problem: Steam *v.* Electricity." The Friday evening discourse on June 4th will be delivered by Prof. J. A. Fleming on "Researches in Radio-telegraphy," and on June 11th by Prof. Sir James Dewar on "Problems of Helium and Radium."

East London College.—On Monday, June 7th, at 8 p.m., a special lecture on "The Technical Aspect of the G.B. System of Electric Tramways" will be delivered by Prof. J. T. Morris. Mr. W. H. Patchell will preside. A course of three lectures on "The Electrification of Main Lines" is to be delivered on Wednesdays, June 2nd, 9th and 16th, at 8 p.m., by Mr. Leonard Murphy.

Institution of Electrical Engineers (Dublin).—At the last meeting of the Dublin Section the following officers were elected for next session:—Chairman, Mr. W. Brown; vice-chairman, Mr. W. Tatlow. Committee: Messrs. N. Hosgood, S. T. Land, M. Ruddle, S F. Pilditch, S. J. R. Price, P. H. Stewart, R. N. Tweedy, A. W. Whieldon, P. S. Sheardown. Hon. Sec., Thomas Tomlinson.

International Congress of Applied Chemistry.—The seventh International Congress of Applied Chemistry was opened at the Albert Hall yesterday. The meetings are being held in the buildings of the University of London, the Imperial Institute, the Royal College of Science, and the Central Technical College.

At a meeting of the Dermatological Section of the Royal Society of Medicine, on Thursday last week, Dr. L. Wickham, of Paris, gave an account of the application of radium to the treatment of disease.

Junior Institution of Engineers.—In connection with the visits of the Institution, an excursion was recently made to Rugby, where, through the courtesy of the respective directors, the works of the British Thomson-Houston Co. and the Rugby Gas Works were inspected. At the former a number of Curtis turbines, of both the vertical and horizontal types, were in hand, with alternators of capacities ranging from 300 kw. to 3,000 kw.

The Labour Exchanges Bill.—The text of the Labour Exchanges Bill, upon which, according to the reports in the papers, all parties in the State appear to found such great hopes, is now published. In the space at our disposal, we can do no more than give a summary of the measure. By Sec. 1 (1) the Board of Trade may establish labour exchanges or assist any labour exchanges established by other persons. A "labour exchange" means any office or place used for the purpose of collecting and furnishing information, either by the keeping of registers or otherwise, respecting employers who desire to engage workpeople, and workpeople who seek engagement or employment. By the other provisions of Sec. (1), the Board may take over any labour exchange already established, and may appoint officers who are to be paid out of the public funds.

In order to bring labour exchanges all over the country under the direct control of the Board of Trade, it is provided that the powers of any central body or distress committee, and the powers of any council to establish a labour exchange or an employment register under the Unemployed Workmen Act, 1905, shall not be exercised except with the sanction of the Local Government Board, and even then only after consultation with the Board of Trade. Sec. 2 of the Bill confers upon the Board of Trade power to make general regulations as to the management of exchanges. It also enables them to make such regulations as will authorise advances by way of loan to be made towards the expenses of workpeople travelling to places where employment has been found for them through a labour exchange. Advisory committees may be established for the purpose of giving the Board advice and assistance. Sec. 3 of the Bill makes it a criminal offence punishable by a fine not exceeding £10 for any person to knowingly make any false statement or false representation to any officer of a labour exchange for the purpose of obtaining employment or procuring workpeople.

Tramway Officials' Association Winding Up.—The Association of Tramway and Light Railway Officials is winding up, and has divided its remaining balance equally between the Municipal Tramways Association and the Tramways and Light Railways Association, free of any conditions.

Copper.—Messrs. Merton's statistical circulars for the fortnight preceding May 15th show the slight upward tendency of the price of copper, due probably to buying by consumers on the principle that bottom prices had about been reached. The visible supplies are still encouraging, the figure for May 15th being 51,444 tons. Shipments from Chile and Australia are well maintained, and North American supplies show some signs of increasing. The general trend of the figures seems to be in the direction of hardening prices.

Alleged Shock Fatality.—The South Staffs. Coroner on Monday held an inquest at Sedgley respecting the death of Benjamin Cole, 37, blast-furnaceman, who was alleged to have been killed by shock when riding on the top of an electric tramcar. Cole was found dead, and another passenger complained of an electric shock. It was stated that Cole was a healthy man, and never had a day's illness. The Coroner said that, under the circumstances, he would have to communicate with the Board of Trade, and the inquiry was adjourned.

Appointments Vacant.—A cookery demonstrator is required for the Accrington Exhibition (August 30th to September 7th). Assistant lecturer in electrical engineering for the Heriot Watt College, Edinburgh (£130). Particulars appear in our advertisement pages to-day.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The successful candidate for the post of assistant to the mains engineer under the Birmingham Electricity Supply Department is Mr. E. C. Jennings, who is at present with the British Thomson-Houston Co., Ltd.

Mr. C. N. Thompson has resigned his position as consumers' engineer under the West Hartlepool Corporation, having been appointed resident engineer at Saltburn Electricity Works for the Cleveland Trust, Ltd.

Mr. P. R. Boulton has been appointed assistant resident engineer at the Summer Lane station of the City of Birmingham Electric Supply Department.

We are informed that Mr. W. Lawson has resigned his position of second engineer-in-charge at the Heston and Isleworth U.D.C. electricity works, having been appointed by Messrs. Beardmore and Son to a position at one of their generating stations in Glasgow.

Tramway Officials.—Mr. Herbert S. Pursey has resigned his post of chief assistant with the Wakefield and District Light Railway Co., in order to join the staff of the Calcutta Tramway Co. He leaves England on June 19th. Mr. H. C. Fraser has been promoted to the post of chief assistant with the Wakefield and District Light Railway Co.

General.—The Canterbury staff of the National Telephone Co. has presented a travelling trunk to Mr. Douglas Jennings, who is leaving for Canada.

Indian Engineering says that Mr. J. H. Cardew, who has just been appointed Electrical Inspector, Madras, has had some experience with large electrical firms in the United Kingdom.

Mr. C. S. Thomson, formerly superintending engineer to the Brush Co., and for the last six years connected with the export business of the British Westinghouse Co. in London, has severed his connection with the latter, and has taken up the position with Messrs. Vickers, Sons & Maxim, which is referred to in our "Trade Announcements" to-day.

We are pleased to learn that Mr. Aubrey V. Clayton, M.I.E.E., has returned to England and has commenced practice as consulting engineer at Egypt House, New Broad Street, London, E.C. Mr. Clayton, it will be remembered, who was formerly with the British Thomson-Houston Co., Ltd., acted as assistant to Mr. H. F. Parshall in connection with the design and erection of the Pinkston power station, Glasgow, and other installations, and for several years has been resident in Sweden, where he established the manufacture of electrical machinery in the engineering works of Messrs. Ungers, Arbra. The success which attended his efforts led to the formation of the Clayton-Unger Co., which later combined with two other electrical firms to form the Förenade Elektriska Aktiebolaget, with Mr. Clayton as chief engineer and manager. We wish him all success.

Obituary.—Mr. C. Collins.—The death took place at Newton Ferrers, near Plymouth, on May 18th, of Mr. Charles Collins, who was for many years a member of the firm of Elliott Bros., electrical engineers, of the Century Works, Lewisham, S.E.

NEW COMPANIES REGISTERED.

Strathpeffer and Dingwall Electric Co., Ltd. (7,111).—This company was registered in Edinburgh on May 5th, with a capital of £100 in £1 shares, to carry on at Strathpeffer and Dingwall the business of electricians, electrical and gas engineers, suppliers of electricity, &c. The subscribers (with one share each) are:—E. W. Blunt Mackenzie, Castle Leod, Strathpeffer, retired major; Countess Cromartie, Castle Leod, Strathpeffer; Miss J. Blunt, Adderbury Manor, Banbury, Oxon. The number of directors is not to be more than three; E. W. B. Mackenzie is one of the first; qualification, £50; remuneration as fixed by the company. Registered office, Kildary, Ross-shire.

Chorley and District Tramways, Ltd. (102,751).—This company was registered on April 29th, with a capital of £300,000 in 50,000 7 per cent. cumulative preferred shares of £4 each, and 3,000 preferred ordinary, and 7,000 ordinary shares of £10 each, to carry out the construction and equipment of the tramways, tramroads and other works authorised by the Preston, Chorley and Horwich Tramways Acts of 1903, 1904 and 1906, to acquire the total authorised debenture (£125,000) and share capital (£500,000) of the Preston, Chorley and Horwich Tramways Co., incorporated by the first of the said three Acts, and to adopt agreements between H. J. Dixon (for the company), and the Preston, Chorley and Horwich Syndicate, Ltd. The subscribers are:—R. C. M. Pooley, 65, London Wall, E.C., physician, 125 preference shares; C. Looker, Finsbury Pavement House, E.C., merchant, 125 preference shares; H. J. Dixon, 77, Alexandra Road, South Hampstead, N.W., secretary, 125 preference shares; Lord Lyveden, Glenwood, Stevenage, 125 preference shares; A. L. Hutchison, 27, Mincing Lane, E.C., gentleman, 1 preference share; G. W. Martin, Blythwood, Wilton Road, Hanwell, W., gentleman, 1 preference share; J. Shears, 8, Winchester Street, South Belgravia, S.W., gentleman, 1 preference share. Minimum cash subscription, 500 preference shares. The number of directors is not to be less than three or more than seven; the first are Lord Lyveden, R. C. M. Pooley, and C. Looker (all permanent); qualification, £500; remuneration, £200 each per annum (chairman £250). Registered office, 154, Finsbury Pavement House, E.C.

Cowper-Coles Engineering Co., Ltd. (102,724).—This company was registered on April 28th, with a capital of £40,000 in £1 shares, to adopt an agreement with Sherard Cowper-Coles & Co., Ltd., A. E. Tugwood (the liquidator thereof), S. O. Cowper-Coles, and J. Macgregor-Laird, and to carry on the business of ironfounders, iron and steel workers, electricians, consulting and electrical engineers and technical consultants or advisers, &c. The subscribers (with one share each) are:—S. O. Cowper-Coles, 87, Victoria Street, Westminster, electro-metallurgist; C. H. Christie, 15, Cranworth Gardens, Brixton, S.W., clerk; G. Gentry, 43, Wroughton Road, Clapham Common, S.W., engineer. Private company. The number of directors is not to be less than two or more than five: the first are J. M. Laird and S. O. Cowper-Coles; qualification one share; remuneration as fixed by the company; registered by Williams and James, Norfolk House, Thames Embankment, W.C.

State of Santa Catharina (Brazil) Development Corporation, Ltd. (102,666).—This company was registered on April 24th, with a capital of £10,000 in 5,000 ordinary shares of £1 each, and 100,000 deferred shares of 1s. each, to seek for and secure openings for the employment of capital in Santa Catharina or elsewhere in Brazil, to examine, explore and test land for minerals or other products, to carry on the business as railway and tramway constructors, contractors, carriers, traders, bankers, capitalists, managers of estates, farms, mines, railways or properties, &c. The subscribers (with one share each) are:—L. W. de Haas, 9, Cumberland Terrace, Finsbury Park, N., merchant; S. C. Russell, Parkside, Ashley Road, Epsom, solicitor; P. Veal, 15, Iliffe Street, Kennington, S.E., clerk; H. Williams, Tan-y-Chwarel, Commercial Road, Peckham, clerk. Private company; the number of directors is not to be less than two or more than five; the subscribers are to appoint the first; qualification (except first directors) £100; remuneration, £200 each per annum. Registered office, 425—428, Moorgate Station Chambers, Moorfields, E.C.

Cardwell, Boorman, Ltd. (102,674).—This company was registered on April 26th, with a capital of £1,000 in £1 shares, to acquire the business of Cardwell, Boorman, Ford-Lloyd, Ltd. (in liquidation), and to carry on the business of electricians, electrical and mechanical engineers, founders, manufacturers of and dealers in electrical, telegraphic and telephone apparatus and appliances, &c. The subscribers (with one share each) are:—C. Stirling, Boswell Court Works, Boswell Court, Devonshire Street, W.C., engineer; A. F. Ward, Maunds, Great Parndon, Harlow, Essex, engineer; N. Ward, 61, Kenninghall Road, Clapton, N.E., engineer; H. E. Saffery, 14, Old Jewry Chambers, E.C., chartered accountant. Private company. The number of directors is not to be less than two or more than four; the first are C. Stirling, chairman, and A. F. Ward, manager directors; qualification, 20 shares. Registered office, Boswell Court Works, Boswell Court, Devonshire Street, W.C.

Radium Lamp, Ltd. (102,710).—This company was registered on April 27th, with a capital of £100 in £1 shares, to carry on the business of manufacturers of and dealers in lamps and parts thereof for lighting, heating, or otherwise by the agency of electricity, gas or other means, &c., and to adopt an agreement with R. Schreiber and J. F. Wakelin. The subscribers (with one share each) are:—J. F. Wakelin, 45, Adelaide Road, Hampstead, N.W., electrical engineer; P. N. B. Tibs, 18, Great Eastern Avenue, Southend-on-Sea, engineer. Private company. The number of directors is not to be more than three; the first are R. Schreiber (chairman and managing director) and J. F. Wakelin; qualification (except first directors), £25. Registered by H. H. Wells & Sons, 17, Paternoster Row, E.C.

Pollak-Virag Rapid Telegraph Co., Ltd. (102,910).—This company was registered on May 8th, with a capital of £100,500 in 100,000 preferred ordinary shares of £1 each and 10,000 deferred shares of 1s. each, to adopt an agreement with Pollak-Virag Syndicate, Ltd., to carry on the business as a telegraph, telephone and electric light and power supply company, to establish, control and regulate telephone and telegraph exchanges, to transmit and facilitate the transmission of telephonic and telegraphic communications and messages, &c. The subscribers (with one preferred ordinary share each) are:—H. Pettitt, 18, Austin Friars, E.C., solicitor; P. J. Hellis, 3, Merthyr Terrace, Castelnau, Barnes, clerk; A. K. Sterne, 18, Austin Friars, E.C., gentleman; A. B. Potter, 18, Austin Friars, E.C., secretary; C. H. Tolley, 18, Austin Friars, E.C., gentleman; H. E. Williams, 28, Charnock Road, Clapton, N.E., gentlemen; A. G. Dobrantz, 22, Wakefield Street, Regent's Square, W.C., clerk. Minimum cash subscription 10 per cent. of the shares offered to the public. Three of the first directors shall be nominated by the Société Générale de Telegraphic Rapide (Pollak-Virag). Two of the first are H. F. Bouillon and Bela Steiner, managing director, and director respectively of the said Société; qualification, £200; remuneration, £200 each per annum (chairman £400). Registered by Slaughter & May, 18, Austin Friars, E.C.

Bastian Electric Heating Syndicate, Ltd. (103,083).—This company was registered on May 19th, with a capital of £10,000 in £1 shares, to adopt an agreement with C. O. Bastian, and to carry on the business of manufacturers of and dealers in electric heaters and cookers and kindred appliances, founders, plumbers, gasfitters, electricians, &c. The subscribers (with one share each) are:—A. C. Newman, 188, Palmerston House, E.C., secretary; H. G. M. Smith, 2, Copthall Buildings, E.C., gentleman; P. Vandervell, 170, Palmerston House, E.C., gentleman; T. Golden, 57, Chaucer Road, Herne Hill, S.E., gentleman; C. Bastian, 2, Lea Road, Heaton Moor, Stockport, electrical engineer; W. T. Hick, 2, Church Court, Clement's Lane, E.C., solicitor; F. Dawson, 2, Church Court, Clement's Lane, E.C., clerk. Minimum cash subscription £1,000. The number of directors is not to be less than three or more than seven; the first are A. C. Newman, H. G. M. Smith and P. Vandervell; qualification of first three directors, one share; of subsequent directors, £100; remuneration (except managing director), £50 per annum (chairman £75) and 5 per cent. of the profits, divisible. Registered by W. T. Hick, 2, Church Court, Clement's Lane, E.C.

Dual Ignition Co., Ltd. (102,902).—This company was registered on May 8th, with a capital of £100 in £1 shares, to carry on the business of manufacturers of appliances for the electrical ignition of internal combustion engines, electricians, manufacturers and warehousers of motors, motor and auto-cars, automobiles, auto-cycles, motor-boats, carriage builders, &c. The subscribers (with one share each) are:—H. Atkinson, 62, Eastwood Road, Cannon Hill, Birmingham, clerk; T. W. Pickup, 22, Mary Road, Handsworth, Birmingham, solicitor. Private company. Table "A" mainly applies. Registered office, Whitehall Chambers, 23, Colmore Row, Birmingham.

Automobile Electric Lighting Syndicate, Ltd. (103,032).—This company was registered on May 15th, with a capital of £5,000 in £1 shares (2,500 deferred), to adopt an agreement with the Polkey Automobile Electric Lighting Syndicate, Ltd., for the acquisition and exploitation of certain patents or rights or privileges, and to carry on the business of mechanical and electrical engineers, generators, accumulators, distributors, and suppliers of electricity for motive power, light, heat, or otherwise, &c. The subscribers (with 200 shares each) are:—J. Polkey, 126, Pitsford Street, Birmingham, lamp manufacturer; W. Peto, Ashtead, Surrey, electrical engineer; A. R. Lancaster, Queen's College, Birmingham, C.A. Private company. The number of directors is not to be less than two or more than five; the first are J. Polkey, W. Peto, and A. R. Lancaster; qualification, 200 shares. Registered office, Queen's College, Paradise Street, Birmingham.

S.M.F. Syndicate, Ltd. (103,145).—This company was registered on May 21st, with a capital of £8,000 in £10 shares, to acquire a concession for tramways between Ponte Delgoda and Furnas in the island of San Miguel, Azores, and to carry on at Azores or elsewhere the business of constructors of tramways and buildings, &c. The subscribers (with one share each) are:—J. Davis, 21, Liverpool Street, E.C., solicitor; S. F. Stratford, 21, Wellesley Road, Ilford, tailor; E. Stratford, 22, Liverpool Street, E.C., tailor; T. B. Catchpool, 14, Cottenham Road, Holloway, N., clerk; R. E. Moore, 56, Mount Pleasant Road, Tottenham, N., clerk; E. J. Knapp, 29, Nevill Road, Stoke Newington, N., clerk; W. Best, 21, Whitehall Gardens, Chiswick, W., director. Minimum cash subscription, £1,000. Registered without articles of association. The first directors are P. Burtin, T. Guillard and G. C. d'Ancourt. Registered office, 21, Liverpool Street, E.C.

Pirelli, Ltd. (103,068).—This company was registered on May 18th, with a capital of £8,000 in £1 shares, to carry on the business of manufacturers of and dealers in india-rubber, gutta-percha and asbestic articles, insulating materials, insulated wires and cables for use for telegraphic, telephoning and other purposes, electric lighting, &c., and to adopt an agreement with Pirelli & Co., of Milan, Italy. The subscribers (with one share each) are:—H. Jacques, 45, Lancaster Road, W., clerk; T. W. Doran, 17, Aden Grove, Green Lanes, N., clerk. Private company. The number of directors is not to be less than two or more than seven; the subscribers are to appoint the first; qualification, £50; remuneration (except managing director) as fixed by the company. Registered by Ingle, Holmes, Sons & Pott, Capel House, E.C.

Premier Lighting and Engineering Co., Ltd. (103,093).—This company was registered on May 19th, with a capital of £3,000 in 2,999 ordinary shares of £1 each and 15 deferred shares of 1s. 4d. each, to adopt an agreement between W. C. Sharpe, W. C. Sharpe, jun., and H. C. Robottom, and to carry on the business of engine builders in accordance with the patents referred to in the said agreement, engineers, machinists, manufacturers of, and dealers in, sanitary, heating, and lighting appliances, electricians, &c. The subscribers (with one share each) are:—H. C. Robottom, Denehurst, Glengall Road, Woodford Green, merchant; W. C. Sharpe, Eastfield, Louth, Lincs., engineer. Private company. The first directors are H. C. Robottom (chairman) and W. C. Sharpe (both permanent, subject to holding 500 ordinary or 5 deferred shares); H. C. Robottom has the right to appoint one other director; remuneration of W. C. Sharpe as permanent managing director, £260 per annum; of H. C. Robottom, £100 per annum. Registered office, 4, Lloyd's Avenue, Fenchurch Street, E.C.

Small Power Dynamo and Motor Co., Ltd. (103,094).—This company was registered on May 19th, with a capital of £15,000 in £1 shares, to take over the business of electrical and mechanical engineers carried on by J. Bentham, F. S. Blakey, R. Wilson and Jane Bentham at Old Lane, Higher Openshaw, Manchester, as the Small Power Dynamo and Motor Co. The subscribers (with 200 shares each) are:—J. Bentham, 97, Abbey Hey Lane, Openshaw, Manchester, electrical engineer; R. Wilson, 28, City Road, Higher Openshaw, Manchester, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are J. Bentham, F. S. Blakey and R. Wilson. qualification, £50; remuneration as fixed by the company. Registered office, Old Lane, Higher Openshaw, Manchester.

Taylor's Patent Safety Shunting Lever, Ltd. (103,169).—This company was registered on May 22nd, with a capital of £40,000 in £1 shares, to acquire the benefit of certain existing inventions relating to improvements for operating points and signals on railways and tramways, to adopt an agreement with H. W. Sanderson and S. H. Aldridge, to develop and turn to account the said inventions, and to carry on the business of mechanical, electrical and general engineers, &c. The subscribers (with one share each) are:—C. A. Denyer, 20, Princes Square, W., solicitor; A. J. M. Millar, 17, Tower Royal, E.C., managing clerk. Private company. The first directors are H. W. Sanderson, W. Halford, A. E. Mitchell and S. Jeffreys; qualification, £100; remuneration, £100 each per annum. Registered by Cox & Lafone, 17, Tower Royal, E.C.

Lechlade Electric Light and Power Co., Ltd. (103,163).—This company was registered on May 22nd, with a capital of £400 in £1 shares, to carry on the business of electricians, mechanical engineers, manufacturers and workers of electricity for power and light, &c. The subscribers (with one share each) are:—A. C. Nash, Riverside, Lechlade, engineer; E. R. Nash, Riverside, Lechlade, engineer; B. P. Gibbons, High Street, Lechlade, grocer. Private company. The number of directors is not to be less than three or more than five; the first are A. C. Nash, E. R. Nash and B. P. Gibbons; qualification, £20; remuneration, 1 guinea per meeting. Registered office, High Street, Lechlade, Gloucester.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Yorkshire (West Riding) Electric Tramways Co., Ltd. (84,167).—This company's annual return, made up to March 19th, has been filed. 46,261 preference and 40,000 ordinary shares have been taken up out of a nominal capital of £600,000 in 70,000 preference and 60,000 ordinary shares of £5 each. £431,805 is considered as paid. Mortgages and charges: £299,000.

Pope's Electric Lamp Co., Ltd. (101,293).—Land registry charge on freehold land and premises at Hammersmith, dated April 16th, 1909, to secure all moneys due or to become due from the company to the London, City and Midland Bank, Ltd.

Hexham and District Electric Supply Co., Ltd. (83,869).—Particulars of £5,000 debentures created January 20th, 1909, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908; the amount of the present issue being £900. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Harper Electric Piano Co., Ltd. (87,135).—Issue on April 27th of £500 debentures, part of series to secure £5,000.

Charing Cross, West End and City Electricity Supply Co., Ltd. (29,122).—This company's annual return was filed on March 11th, when 80,000 preference, 80,000 ordinary, 80,000 City Undertaking preference and 70,000 City Undertaking ordinary shares had been taken up out of a nominal capital of £2,100,000 in 180,000 preference, 180,000 ordinary, 80,000 City Undertaking preference and 80,000 City Undertaking ordinary shares of £5 each. £5 per share has been called up on the preference, ordinary, and City Undertaking preference shares, resulting in the receipt of £1,200,000; £350,000 is considered as paid on the City Undertaking ordinary. Mortgages and charges: £931,846.

Oxford Electric Co., Ltd. (24,685).—This company's annual return was filed on March 31st, when 20,000 ordinary and 5,500 preference shares had been taken up out of a nominal capital of £150,000 in 20,000 ordinary and 10,000 preference shares of £5 each. £93,500 has been paid on 18,200 ordinary and 5,500 preference, in addition to £1,550 paid on 310 forfeited shares; £34,000 is considered as paid on 6,800 ordinary. Mortgages and charges: £50,000.

Scarborough Electric Supply Co., Ltd. (37,569).—This company's annual return was filed on March 25th, when the entire capital of £103,000 in £10 shares had been taken up and paid for in full. Mortgages and charges: Nil.

Direct United States Cable Co., Ltd. (11,597).—This company's annual return was filed on February 17th, when 60,710 shares had been taken up out of a nominal capital of £1,300,000 in 65,000 shares of £20 each. £1,214,200 has been received. Mortgages and charges: Nil.

Turners & Manville, Ltd. (89,658).—This company's annual return was filed on March 17th, when 20,012 shares had been taken up out of a nominal capital of £50,000 in £1 shares. £10,621 has been received, and £9,391 is considered as paid. Mortgages and charges: Nil.

Beck & Moss, Ltd. (69,298).—This company's annual return was filed on March 6th, when the entire capital of £2,500 in £1 shares had been taken up. £525 has been received, and £1,975 is considered as paid. Mortgages and charges: £700.

Northallerton Electric Light and Power Co., Ltd. (59,301).—Issue on April 7th of £260 5 per cent. debentures, part of series created December 11th, 1900, to secure £260, charged on the company's property, present and future, including uncalled capital. No trustees.

This company's annual return was filed on March 11th, when 1,151 preference and 4,561 ordinary shares had been taken up out of a nominal capital of £6,500 in 2,9 0 preference shares of £1 each and 12,000 ordinary shares of 6s. each. £2,519 6s. has been received. Mortgages and charges at date of return: £5,400. Issued April 7th, 1909: £260.

New Ignition Syndicate, Ltd. (91,175).—Issue on April 20th of £500 debentures, part of series created November 12th, 1908, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. No trustees.

This company's annual return, made up to April 12th, has been filed. The entire capital of £6,000 in £1 shares has been taken up. £2,027 has been received and £2,978 is considered as paid. Mortgages and charges: £3,000.

Bradbury & Co., Ltd. (8,327).—This company's annual return was filed on March 13th, when 12,631 shares had been taken up out of a nominal capital of £90,000 in 15,000 shares of £6 each. £83,070 has been received, including £7,287 paid on 995 forfeited shares. Mortgages: £5,653. Debenture stock: £84,988.

Telegraph Construction and Maintenance Co., Ltd. (1,147 C).—This company's annual return, made up to March 16th, has been filed. The entire nominal capital of £448,200 in 37,350 shares of £12 each has been taken up, and £448,200 has been received. Mortgages and charges: Nil.

Richard Pape, Ltd. (97,901).—Issue on April 5th of £100 debentures, part of series created September 16th, 1908, to secure £1,000 charged on the company's undertaking and property, present and future, including uncalled capital. No trustees. Previously issued of same series: £500.

Cleveland and Durham Electric Power, Ltd. (89,539).—Debenture dated March 31st, 1909, to secure £10,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Barclay & Co., Ltd.

Kensington and Knightsbridge Electric Lighting Co., Ltd. (26,193).—Particulars of debenture stock created January 31st, 1895, to secure not more than the amount of the paid-up capital, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £25,000. Property charged: Certain freehold and leasehold land and buildings, and the company's undertaking and property, present and future. Trustees: R. E. B. Crompton and G. H. Hopkinson.

A. Reyrolle & Co., Ltd. (70,210).—This company's annual return was filed on April 16th, when 17,500 ordinary and 18,819 preference shares had been taken up out of a nominal capital of £40,000, in 20,000 ordinary and 20,000 preference shares of £1 each; £29,319 has been received, and £7,000 is considered as paid. Mortgages and charges: £14,400.

Smithfield Markets Electric Supply Co., Ltd. (53,354).—This company's annual return, made up to April 2nd, has been filed; 12,000 shares have been taken up out of a nominal capital of £100,000 in £5 shares. £60,000 has been received. Mortgages and charges: £54,700.

London Electric Supply Corporation, Ltd. (24,957).—This company's annual return was filed on March 5th, when 111,000 ordinary and 69,840 preference shares had been taken up out of a nominal capital of £1,050,000 in 200,000 ordinary shares of £3 each and 90,000 preference shares of £5 each. £3 per share has been called up on 111,000 ordinary and £5 per share on 69,840 preference shares, resulting in the receipt of £682,880, including £160 paid on 160 forfeited shares. Mortgages and charges: £387,355.

Leicestershire and Warwickshire Electric Power Syndicate, Ltd. (72,274).—Issue on April 19th of £550 debentures, part of series created July 9th, 1907, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. No trustees.

South Metropolitan Electric Light and Power Co., Ltd. (47,875).—This company's annual return was filed on March 29th, when 123,000 ordinary, 50,000 second preference and 142,968 first preference shares had been taken up out of a nominal capital of £500,000 in 250,000 ordinary, 100,000 second preference and 150,000 first preference shares of £1 each. £1 per share has been called up on 120,500 ordinary and 137,600 first preference and 5s. per share on 50,000 second preference shares, resulting in the receipt of £270,600. £7,868 is considered as paid on 2,500 ordinary and 5,368 first preference. Mortgages and charges: £254,175.

Engineering Instruments, Ltd. (66,427).—Particulars of £5,000 debentures created November 30th, 1906, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £320. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Power Plant Co., Ltd. (79,151).—This company's annual return was filed on March 22nd, when the entire capital of £5,000 in £1 shares had been taken up. £4,992 has been received, leaving £8 in arrears. Mortgages and charges: £5,000.

New System Private Telephone Co., Ltd. (73,732).—Issue on May 4th of £1,000 debentures, part of a series of which particulars have already been filed.

CITY NOTES.

Kalgoorlie Electric Tramways, Ltd.

The directors' report to December 31st, 1908, shows that the gross receipts for the year were £47,368, as compared with £48,008 for 1907, while the net profits amounted to £15,400, against £16,270. The small decrease in receipts and profits indicated above appeared likely, in the earlier part of the year, to be far greater, but the directors are pleased to say that during the last four months of 1908 a decided improvement in traffics was experienced. This improvement is being maintained, and the recent excellent developments on some of the Kalgoorlie mines give every promise that the result of the current year's working will contrast favourably with that of the past 12 months. During the year the cars travelled 647,297 miles and carried 3,028,419 passengers as compared with 650,530 miles run and 3,052,241 passengers carried during 1907. The earnings per car-mile in 1908 were 17·53d., and the expenses 11·25d., as against 17·63d. earnings and 11·17d. expenses during 1907. The expenses per cent. of earnings in 1908 were 64·17 compared with 63·36 in 1907. The whole of the company's rolling stock, plant and overhead lines have, in accordance with the policy previously pursued by the directors, been efficiently maintained. The question of depreciation has engaged the serious attention of the directors, but as the company had only the depreciation on cars, track and overhead materials to deal with, the rate of depreciation was lower than would be the case if the company owned its own power station. It was probable that the surplus profits, after payment of debenture interest and sinking fund, would be sufficient to deal with depreciation and renewals, and for the present, therefore, all such surplus profits must be retained in hand for this purpose. A further sum of £5,155 of "A" debenture stock has been purchased for redemption, making the total stock redeemed at the date of the report, £14,016. The directors record their appreciation of the work done by the whole of the staff in Western Australia for the year under review. With regard to future prospects, it is undeniable that affairs generally in Western Australia, and especially at Kalgoorlie, are undergoing a very encouraging change as compared with the past few years.

Kalgoorlie Electric Power and Lighting Corporation, Ltd.

Mr. Roger Wallace, K.C., presided on May 19th at the meeting held at Winchester House, E.C. In proposing the adoption of the report (see Electrical Review, May 21st, page 852), the Chairman said he had the pleasure to tell the shareholders that the plant had been working very satisfactorily during the year, with the exception of part of the new unit, and he had no doubt that that eventually would prove to be all right. At the present moment they had a dispute on concerning the efficiency of a portion of that plant, and as the matter was still *sub judice*, he did not propose to make any reference to it. Unfortunately, the plant should have been ready in October, but it had not been satisfactorily at work until quite recently, and they did not know actually from the cables whether it was satisfactorily at work at the present moment. He was pleased to say that this drawback, although it had materially affected their profits, did not cause any stoppage of the works, and with the plant that they had, they were able to give an efficient supply. They would have observed that, although the new unit cost upwards of £20,000, they had been enabled to find the money without having to raise fresh capital, and that was the reason why they had an overdraft of £4,000 from the bank. They also had to face a strike at the mines, several of which were stopped, which, of course, materially affected their revenue. When Mr. Doolette addressed them last year, he drew attention to the probability of additional ore being found at a lower depth in good paying quantities in Kalgoorlie. That prognostication had been verified, and there was no doubt that the anticipations of future work at the mines in Western Australia were very encouraging, and pointed to a longer life than a great many anticipated. He could not speak too highly of Mr. Crocker, their manager, in Australia, who, during the strike and the putting-down of this new unit, had never failed them, and the fact that the plant had been kept steadily going throughout the whole period showed what a very capable manager he was. They had received a letter from Mr. Crocker that day, in which he pointed out that in his opinion it would be necessary to still further increase the plant, because the demand, in consequence of new developments, pointed to an increased use of electricity in the mines. The directors would carefully consider the matter. Of course they could not always put down new units with the funds at their disposal, and it would be a matter for consideration as to how far they would meet this demand. The question was one which required a great deal of consideration, but he had no doubt they would come to a satisfactory conclusion about it. As to the ordinary dividend, he wished it had been larger, but the directors had thought it wiser to declare a smaller distribution in view of the fact that they still had an overdraft at the bankers which, they thought, ought to be paid off as soon as possible.

Mr. G. P. Doolette, in seconding the motion, said he could assure the shareholders that the prophecy he made 12 months ago as to the life of the mines in Australia had been more than fulfilled. That meant that the life of their company would be lengthened, and he looked forward with great hopefulness to a long life and prosperity for the company.

The report was adopted.

Perth Electric Tramways, Ltd. (Western Australia).

The directors report that during the year ended December, 1908, the gross receipts amounted to £73,339, as compared with £75,042 for the previous year, while the profit amounted to £28,721, against £31,177. The decrease in profit is partly due to diminished traffic receipts (for the expense of running is almost the same whether the traffics be large or small), partly to increased facilities and increased mileage necessary to give better service on certain lines, partly to increased wages to employés who have been long in the company's service, and partly to increased expenditure on renewals of track, rolling stock, overhead material and power house machinery.

The decrease in traffics is, beyond a doubt, only temporary, and is largely attributable to the increased interest taken in agriculture in the neighbourhood of Perth. The effect of this has been to temporarily withdraw capital from Perth itself into the agricultural district which, in the opinion of those most competent to judge, will re-act beneficially as soon as the capital invested returns profitable results. This will naturally induce further settling and immigration, and will lead to increased trade for the City of Perth, as the centre of this most promising agricultural district. In October last, the Nedlands Park Tramway was completed, and it is now being operated. The traffic on the new line is satisfactory. The company has also been pressed to build extensions into North Perth, South Perth, Maylands and Bayswater and West Leederville, and has the option of buying outright the Victoria Park extension, part of the capital for which was provided by the Victoria Park Council five years ago. For the purpose of dealing with these extensions the Perth Traction and Development Co., Ltd., is being formed to act as an auxiliary to the Perth Electric Tramways, Ltd. It is hoped that much of the capital of the new company will be subscribed in Perth itself, and unless it be subscribed it is certain that none of the extensions asked for can be made. £4,375 first debenture stock was redeemed at a cost of £4,469. After payment of interest and sinking fund on the first and second debenture issues and trustees' fees for the year, the balance at credit of profit and loss account is £11,154, which is carried to profit allocation account, plus £946 brought forward, making £12,100, from which has to be deducted £6,000 dividend paid on preference capital.

The amount to the credit of profit and loss account, after making the above payments, is sufficient to pay a dividend of 5 per cent. on the ordinary shares as in the two previous years, leaving a balance of £1,100 to be carried forward, but the question of depreciation and renewals must be boldly faced. The whole of the lines, rolling stock and machinery are kept in a perfect state of repair, but no track, no machinery and no rolling stock can last for ever, and the directors are of opinion that the recommendation made by them three years ago, to set aside a minimum sum of £2,500 per annum for reserve fund must be rigidly adhered to. This being so the directors have decided to put aside £2,500 from this year's profits, and consequently can only recommend a dividend of 2½ per cent. upon the ordinary shares for the past year, which will leave £1,100 to be carried forward. The directors have made inquiry from every available source as to the probability or otherwise of an increase in trade and population in the City of Perth, and from all sides have received the most encouraging reports as to the almost certainty of its future prosperity, but it is not wise to anticipate this by dividing profits up to the hilt, and the shareholders must therefore await the improvement which is so confidently predicted. The directors record their appreciation of the services of Mr. Somerset, Mr. E. Graham Price, and the staff in Western Australia during the past year.

Mr. H. J. Somerset, the manager and engineer, in his report gives the following figures:—

During the year 1908 the trams travelled 1,208,353 car-miles, as against 1,178,716 car-miles in 1907; and carried 7,642,887 passengers, as against 7,790,934 passengers in 1907. The total receipts in 1908 were £73,121, as against £74,472 in 1907, a decrease of £1,351. The total Perth expenses in 1908 were £41,455, as against £40,733 in 1907, an increase of £722. The excess of receipts over expenditure in 1908 was therefore £2,073 less than in 1907. The earnings per car-mile were 14·52d. in 1908, as against 15·17d. in 1907; while the expenses were 8·09d. as against 8·29d. in 1907. The expenses per cent. of earnings in 1908 were 56·7, as against 54·7 in 1907. During the year the rolling stock and plant have been fully maintained.

The mileage authorised is 30 m. 2 ch., and that constructed 29 m. 12 ch.

West India and Panama Telegraph Co.

The meeting of this company, held on May 19th at Winchester House, E.C., was presided over by Mr. W. B. Kingsford, who, in proposing the adoption of the report (see Electrical Review, May 14th, page 814), said that the receipts were £2,391 less than for the corresponding half-year. Strictly speaking, the actual net decrease in traffic and other receipts was £3,391, but owing to their having been enabled this year to bring in an extra £1,000 from the income-tax account, the decrease was reduced by that sum. The expenditure had amounted to £22,160, which was £868 less than for the corresponding period. That sum represented the difference between a decreased expenditure for maintenance of cables and certain increases in other items. As to the traffic receipts for the current half-year, it was a little disappointing to find that up to the end of April there was a decrease of £1,657, as compared with the corresponding four months of 1908. He was afraid that seemed to show pretty clearly that there was little or no indication of any improvement in the West Indian trade, upon which, of course, their traffic absolutely depended. At the last meeting he informed them that the plant for the installation of wireless telegraphy between British Guiana and Trinidad was just on the point of being shipped from London. He was very glad to state that the installation had now been completed in British Guiana, and the contractors had almost finished the establishment of the station in Trinidad. It would interest them to know that the main masts—one in British Guiana and one in Trinidad, were 225 ft. high, that was to say, 23 ft. higher than the Monument in London. They would, therefore, readily imagine that the transport overland of that heavy material had been a work of no little difficulty. They were informed that the installation would probably be completed at the end of the present month, and they hoped it would prove to be an important and useful addition to their cable communication between the two colonies.

Mr. Henry Holmes seconded the motion, and the report was adopted.

British Westinghouse Electric and Manufacturing Co., Ltd.

The ninth annual general meeting was held on Monday at Hamilton House, Victoria Embankment, Mr. J. Annan Bryce, M.P., the deputy chairman, presiding.

In proposing the adoption of the report (see Electrical Review, May 21st, page 855), the Chairman said they were sorry to report that the profit on the year's business had been more than absorbed by interest and charges. The falling off in the trading profit was due to the universal depression in business. Not only was the volume of orders smaller, but the severe competition for such as there were, necessitated a further reduction in prices. As a result of the arrangements described in the last report, namely, the liquidation of the indebtedness of the American companies and the issue of prior lien debentures, the financial position of the company was much improved. Temporary loans had disappeared, the item of sundry creditors had been much reduced, and there was a large balance of cash in hand. The size of that balance was due to the diminished volume of business and to the reduction in the items of sundry debtors, and stock and materials in hand. £5,000 of prior lien debentures had been redeemed, under the operation of the trust deed. The directors had decided to charge this amount to revenue, notwithstanding that the final instalment on the debentures was only received in October last. As regarded the reserve for employers' liability the amount to the credit of that account was slightly less than last year by reason of the fact that as the sum considerably exceeded any liabilities for workmen's compensation, the directors did not deem it necessary to set aside so large a percentage as heretofore. Turning to the other side of the accounts, the items were practically the same as last year. The first item, stock and material on hand £424,778, was rather more than £100,000 less than last year, owing principally to the policy of maintaining stocks at as low a level as possible compatible with the prompt fulfilment of orders. Some of the items making up this total had been written down out of revenue during the last two years, and, therefore, stood on the books at under cost. Completed work on contracts, £390,565, was slightly higher than last year. With regard to that item, there were several old matters still in dispute, the most important of which was in connection with a contract dated 1901, with the Underground Electric Railways Co., by which the company undertook to furnish certain apparatus for their Chelsea power house. The amount involved was large, but as the question had been referred to arbitration, it was inexpedient to discuss it at present. Any losses resulting from the settlement of these matters must be charged to revenue, as no reserves had been provided therefor. Sundry debtors, £94,631, were slightly lower than last year, mainly due to prompter payments. Prior lien debenture issue expenses consisted of the 2 per cent. discount at which they were issued, underwriting expenses, &c. It had been decided that these expenses should be written off gradually over the term of the debentures. Shares in other companies, £287,092, showed a large reduction as compared with the last year, in consequence of the transfer of shares of the Traction and Power Securities Co. The largest portion of the item was now represented by shares of the Clyde Valley Electrical Power Co., whose business was now rapidly increasing. The balance was in shares of the Traction and Power Securities Co., and small items in other companies. Turning to the profit and loss account, the balance of £11,341 brought forward from last year had been almost wholly absorbed in the settlement of losses and claims not provided for at the time of the capital reduction. On the other side of the account was the interest on temporary loans accrued for the period before the issue of the prior lien debentures in April, 1908. However, if they compared the interest on temporary loans and prior lien debentures in 1908 with the interest on temporary loans, &c., for 1907, they would find there was a saving of £4,969. The item, exhibition expenses, £2,981, arose out of two exhibitions during the year under review; the Franco-British in London and one at Manchester, at both of which the directors felt it advisable that the company should be adequately represented. These expenses did not recur each year, and the expenses, therefore, might fairly have been spread over several years, but, under all the circumstances, it had been thought better to charge the whole cost to the year in which it had arisen. The item of £447, "expenses on surplus lands and buildings," included charges in respect of the steel foundry which was closed in the early months of 1908, the directors fearing that to continue operations would result in a serious loss, owing to the restricted volume of business then offering. The directors much regretted the closing down of such a large and important adjunct of the works, but subsequent events had proved the wisdom of their decision. As to the general position and prospects of the company, a careful study of comparative figures for the four years beginning 1905 led the directors to the conclusion that the many changes and improvements that had been made during the past three years had resulted in a marked increase in efficiency, and notwithstanding the heavy handicap of a large plant, restricted volume of business and severe cutting of prices, the accounts showed that the percentage of gross profit returned on the apparatus manufactured had been satisfactory. Among the more important economies that had been

effected was that of factory expenses. These expenses went on almost irrespective of the volume of business passing through the works. During the past three years, notwithstanding an increased volume of manufacture, they had been reduced by 30 per cent., with a resulting saving of £70,000 per annum. Other expenses connected with the business showed a decrease at the rate of £10,000 per annum, and this saving had been accompanied by a marked increase in efficiency of manufacture. Under this combination of economy and improved efficiency the percentage of gross profits had more than doubled. The improvement had been effected in spite of an average reduction in selling prices of about 20 per cent. The directors had carefully considered the possibility of a further reduction of staff, with a view to economy, until better times arrived. The question would be kept before them with due regard to the necessity of maintaining the level of efficiency and capacity to deal with any business which might offer. During the past year the company had secured several important contracts, among others that for a large power and electric plant at Bahia Blanca, two 5,000-kw. units for the London County Council, and orders for tramway equipments for London and Glasgow. The future of the company seemed to depend mainly upon the volume of business which could be secured. At present the manufacturing power of Great Britain was largely in excess of the demand of the home markets, and the hope of an increased volume of orders depended on the possibility of a larger export business, and an extension of the company's territory, proposals for which had been laid before their American friends. For the moment, however, no great help was to be looked for on the side of export business, owing to the general depression all over the world resulting from the American financial crisis of 1907, and with a reduced demand, the competition for orders abroad had been almost as severe as at home. There were, however, signs that the wave of depression was passing away, and it might be hoped that, after the turn of the year, the outlook would be brighter. It might be doubted, however, whether the position of the electric industry in this country could become permanently sound until British purchasers realised, as they had done in Germany and America, that the standardisation of manufacture was in their interest as much as in that of the manufacturer. To this having been realised in Germany was due the fact that, though the electrical manufacturing capacity of that country was far larger than that of Great Britain, it was occupied to an immensely greater extent by the supply of the demand in Germany itself, where, owing to the cheapness of manufacture resulting from standardisation, the application of electrical apparatus was infinitely more extensive in every industry; and the relative cheapness, aided by the enterprise of the large industrial banks, numerous in Germany but non-existent here, enabled the German manufacturer to compete on favourable terms with his surplus product, which was much less in volume than that of this country, in the foreign and colonial markets which naturally belonged to us. When consumers have had brought home to them the elementary axiom that the manufacture of an article to 10 patterns only was immensely cheaper than the manufacture of it to 100 patterns, demand would begin to overhaul supply. There were already faint signs that this fact was beginning to dawn upon the British consumer.

Mr. E. Goulding, M.P., seconded the motion, and the report was adopted without discussion.

Great Northern Telegraph Co., Ltd., of Denmark.

At the company's meeting, held at Copenhagen on April 24th, Commodore E. Suenson, D.R.N., said that during 1908 their cables had suffered more than usually from interruptions, of which there had been no less than 24 on 11 cables in Europe, and 10 on six cables in the Far East, without reckoning five interruptions necessitated in connection with extensive renewals of the cables between Hong Kong, Shanghai and Nagasaki with heavier types.

No other system of submarine cables has suffered so much from damage by fishing vessels as that of the company, and particularly the cables in the North Sea connecting Great Britain and France on the one hand with the Scandinavian countries on the other hand. The British Government Committee has advised the adoption of the regular inspection of trawls which this company advocated in vain many years ago. It is true that the lack of protection for the cables has also had a beneficial effect for the company, inasmuch as it has obliged it to provide duplicate cables for the transmission of the traffic during interruptions. Besides, every interruption necessitates a partial renewal, sometimes with heavier types of cable, and the long life of the cables may, therefore, be compared with that of the famous vessel sent annually to Delos by the Athenians, which lasted for centuries. This continual struggle against the havoc wrought by fishing vessels is, however, very expensive to the cable companies, which are at the same time constantly called upon to reduce their tariffs, regardless of the greater cost of submarine cables and their maintenance, compared with that of aerial lines, not to speak of wireless telegraph systems.

The service by the Vladivostock and Kiachta routes, which connect the company's cables in Europe with those in the Far East, has never before reached a higher standard than during the past year.

The International Telegraph Conference held at Lisbon during May and June last year has not introduced many important changes in the International Rules and Regulations, but it has adopted tariff reductions in the European *Régime* as from July 1st next, which, together with those already introduced for the local traffic in the Far East, are sure to affect adversely this company's receipts. The rates charged by the European Governments are already so low that they barely cover the working expenses, and the reductions introduced at Lisbon are too small to be of any appreciable value to the public, because the benefit to the individual sender will be altogether insignificant, whilst the loss of revenue to the administrations will be considerable, as they will have to bear the reduction on the *whole* of the traffic passing over their lines. When, therefore, Utopians who are not satisfied with reasonable reductions demand a uniform rate of 1d. a word, they are asking for the impossible. The adoption of such a proposal would obviously be detrimental to the service and mean the ruin of all administrations, governmental or private, and bring about the forced transfer of privately owned cables to the State. An enormous loss of revenue would be the result, and this would have to be borne by the general taxpayer, although more than 90 per cent. of the International traffic is of a commercial nature and is dispatched solely in the sender's individual interest.

Fortunately, however, the sensible merchants prefer a good service to low rates, a fact which cannot but assist the cable companies in a possible competition from wireless telegraph companies, a competition to which holders of shares in cable undertakings are, perhaps, inclined to attach too much importance. The more extensive use of wireless telegraphy has accentuated the great defects of the new invention, particularly the facility with which telegrams can be tapped, whereby the secrecy of the telegrams becomes more or less illusory. The experience of the last year has, therefore, only tended to confirm this company's confidence in the absolute superiority of the old system of telegraphy by wire wherever practicable. The cable and wire manufacturers would hardly have had such a prosperous year if these views were not shared by the Governments and private administrations who adhere to the use of wires, submarine, underground or overhead.

The company has received notice from the Norwegian Government that the concession for the Norwegian-Danish cable, granted in 1868, prolonged in 1880, and expiring at the end of 1910, will not be renewed. The Norwegian Government has offered to purchase the Norwegian-Danish cable jointly with the Danish Government, but the company is still awaiting the decision of the latter before negotiations can be entered upon. The loss of all the Norwegian traffic after 1910 will mean a considerable decrease in the company's receipts, as the traffic is a very large one and the price to be paid for the cables, as proposed by Norway, would only be the estimated value of the cable itself, and would not include any compensation for the company's loss of revenue. A similar fate may sooner or later befall other of the company's cables at the expiration of the concessions.

The negotiations in the Far East entered into with the Japanese Government in 1907 have not made much progress in 1908. The Chinese landline system, which was formerly the property of a private Chinese company, although managed by a Government administration, has in the course of the year been completely transferred to the Government, the latter having purchased all the shares.

There has been a further decline in traffic receipts during 1908 of some £18,000. The ordinary expenses increased by £11,800.

In all the circumstances, and seeing that there was a further decrease of traffic receipts in the first month of this year, the board of directors propose to make the bonus 2 per cent. less than that for the last two years, thus making the dividend and bonus 18 per cent. for the year, of which 5 per cent. has already been paid as interim dividends. The alterations in the administration of the company in Copenhagen were effected in September last by the chairman resigning the position of managing director and the appointment of a board of management consisting of four members, viz., general managers, K. Suenson (formerly secretary), P. Michelsen; engineer-in-chief, K. O. A. Gulstad; inspector of telegraphs, Captain H. Rothe, D.R.E.

Deutsch-Niederlaendische Telegraphen Gesellschaft.

The report of the directors for 1908 states that the working of the cable network again proceeded satisfactorily and without any noteworthy interruptions. The decline in the net profits was partly due to the diminution in the telegraph traffic in consequence of the unfavourable economic conditions in the Far East, under which all telegraph companies working in that region had to suffer, and partly to the increase in expenses due to advances in salaries, higher taxes and pension insurance of the officials. As the news from China and Japan now announces an improvement in the business situation, it is expected that a gradual revival of trade will take place together with an augmentation in the telegraph traffic. The accounts for the two years show the following figures:—

	1908.	1907.
Ordinary share capital	£850,000	£850,000
Bonds	337,500	350,500
Net profits	38,518	40,640
Dividend, per cent.	6½	6½

The amount provided for cable maintenance has been £10,215, as compared with £10,231 in 1907; the appropriation for the cable renewal fund is £8,750, or the same as in the preceding year; depreciation is £2,009, as against £2,318; and redemption of the cable network is £13,150, as compared with £12,700 in 1907. At the recent meeting, when the report and accounts were approved, it was mentioned that the sum of £1,500 had been set aside towards the cost of providing duplex apparatus which would not be required for a number of years; and as this particular fund now stood at £5,500, it would only be necessary to add £2,000 in order to complete the amount of £7,500 needed for the purpose.

Neuhausen Aluminium Co.

The report of the directors of the Aluminium Industrie Gesellschaft, of Neuhausen, for 1908 states that, owing to being attracted by the financial results obtained by the older companies during recent years of development, various small and large aluminium works had been established, and these already depressed the price of aluminium to a very low level in the first quarter of 1908. When the syndicate was dissolved, against the wish of the Neuhausen Co. and on the proposal of a French company, in the autumn of last year, a bitter contest arose between all the producers with the special object of securing orders for 1909. The result was shown by a further fall in prices to below the cost of manufacture, which had already led one of the newly-established companies to liquidation. A bright side was afforded by the observation that, in consequence of the cheapening of the metal, new uses had arisen for aluminium, and had also been extended. The report proceeds to remark that the employment of the company's works was satisfactory during the year quantitatively, and work was also assured for the current year. The company was also sufficiently occupied in the production of carbide of calcium, although at prices which were not very remunerative; and the output of nitric acid and by-products will be commenced this year. The accounts show the following figures for the past two years:—

	1908.	1907.
Share capital paid up	£520,000	£520,000
Bonds	220,800	223,600
Gross profits	132,520	299,400
Depreciation provision..	17,600	90,200
Dividend	93,600	104,000
Dividend, per cent.	18	20
Balance forward..	42,000	55,000

The report further states that the works at Navizance, with a capacity of 20,000 H.P., have been completed and been in operation since last August. It was expected that the starting of the Rhone works, having 40,000 H.P. at disposal, would be begun in a year. The new installations at Goldschmieden and Marseilles for the production of alumina and by-products were in operation, and yielding satisfactory results, as were the company's own deposits of bauxite. It is added that the patents account is entirely written off, and that the sum of £228,000 was expended during the year for the extension of the new works at Chippis.

Continental Electrical Investment Companies.

The reports of two electrical investment companies have just been issued for 1908, one being a German and the other a Swiss undertaking. In the case of the former, which is the Gesellschaft fur Elektrische Unternehmungen, of Berlin, the directors state that notwithstanding the economic depression in Germany and in other countries, the receipts from dividends and interest were greater than in 1907, but those from the sale of securities decreased almost to a corresponding extent. Apart from the disposal of shares in a number of undertakings, the report shows that the entire holdings of shares in the Brown, Boveri & Co. were sold, as also were the ordinary shares, founder shares and debentures held in the Electricity Supply Co. for Spain, Ltd. The British Thomson-Houston Co., in which the company is represented by shares of £39,820, will not distribute any dividend, it is mentioned, for 1908, despite a certain improvement in the business situation. The accounts of the investment company indicate net profits of £184,282, as compared with £184,305 in 1907, and it is proposed to pay 8 per cent. on the share capital of £1,575,000, being the same rate as in each of the two preceding years. It is now intended to increase the share capital to £2,250,000 in order to extinguish a floating debt which has existed for the past three years, and which principally consists of funds placed at the disposal of the company by associated companies, the latter now requiring the money to cope with their constant development. The second investment company is the Swiss Gesellschaft fur Elektrische Industre of Basle, which has relations with the group connected the Siemens and Halske Co., of Berlin. The directors' report states that the general depression in business and the introduction of metallic filament lamps caused a postponement of the development of the receipts of various power stations closely associated with the company, although this is only regarded as of a transitory character. These undertakings are located in various countries in Europe. As net profits the accounts show the sum of £38,012 for 1908, as contrasted with £37,380 in the preceding year, and it is proposed to distribute 7 per cent. on the paid capital of £400,000, the rate being identical with that of 1907. The company has also a bond capital amounting to £1,200,000, whilst the similar capital in the German investment company totals £1,676,500.

The Paris Popp Co.

A transaction of a certain amount of interest has just taken place in connection with the Compagnie Parisienne, de l'Air Comprimé Force Motrice et Eclairage Electrique, which is better known as the Popp Co., and which is, or is to be, merged into the Compagnie Parisienne de Distribution d'Electricite, the undertaking which will definitely take over all the electric lighting secteurs in Paris in 1913. The operation relates to the disposal to French interests of the large German holding shares in the Compressed Air Co. in question. As will, perhaps, be remembered the latter company was for many years unable to pay any dividends, and it was only possible to repay between 1903 and 1905 the large advances which had been made to it, this being followed by the first distribution of profits in 1906-7 in the form of a dividend of 6 per cent. Apparently the German shareholders who were embodied in the International Electricity Co., of Berlin, had come to the conclusion that dividends would be entirely out of the question, and the latter was accordingly dissolved and the shares divided among the shareholders who included the Disconto Gesellschaft, the Dresden Bank, Messrs. Bethmann, of Frankfort-on-Maine, and Messrs. Oppenheim, of Cologne. The first-mentioned bank held the largest number of shares in the French company, and the holding of the second bank is reported to have actually been written down to the value of 1s. But the surprising progress of the Compressed Air Co. has brought about an alteration in the situation of affairs, and negotiations which have been proceeding for sometime past have now led to the conclusion of a provisional agreement for the sale of the shares in German ownership to a French group headed by the Banque de Paris et des Pays Bas. The amount of the German holding is stated to have been £700,000, but this seems to be an exaggeration. At any rate, if the holders have been offered, and have agreed to accept, a price of 145 per cent., they have obviously made considerably profits out of the transaction, although this is considered to be merely compensation for past losses. The Compressed Air Co., which has always been under French control, has now become entirely French in share ownership, and the former German shareholders have every reason for congratulation upon the turn which events have taken.

Berlin Elevated and Underground Railway.

The report for 1908 of the directors of the Gesellschaft für Elektrische Hoch und Untergrundbahnen, of Berlin, states that the network was extended by the opening of two important sections—the line to the West End, which was started at the end of March; and that from the Leipziger Platz to the Spittelmarkt, which was inaugurated at the beginning of October. At present the total length is 11·03 miles, as compared with 7·93 miles at the end of 1907. A general decline in the passenger traffic took place during the year, particularly in the second half, in consequence of the unfavourable economic situation. The number of passengers carried certainly increased, but this is attributed to the addition of the two new sections. The traffic on the Leipziger Platz-Spittelmarkt line did not attain the expected volume, and it is believed that the first working year will pass away before the line gains its natural traffic, after which a comparatively large advance is anticipated. It is also expected that on the return of normal economic conditions, the patronage of passengers on the other sections will exhibit an increase corresponding with that in former years. The accounts show the following figures for the past two years:—

	1908.	1907.
Ordinary share capital	£2,500,000	£2,000,000
Loan capital	1,998,000	1,948,500
Gross profits	180,187	155,678
Renewals fund provision	26,250	22,500
Taxes paid to city authorities ..	7,418	6,617
Depreciation provision..	3,622	3,471
Net profits	92,562	86,975
Dividend, per cent.	5	5

The total ordinary capital participating in the dividend for 1908 amounts to £1,675,000, and the additional loan capital also is not fully entitled to the 4 per cent. interest which it bears, as all of it was not issued during the year. The number of persons carried increased from 41,442,124 in 1907 to 44,639,029, the augmentation being, as already stated, due to the opening of the two new sections; and the average receipts rose from 1·522d. per passenger to 1·549d. in the same years respectively. In addition the short surface or level line of a length of 1·36 mile transported 4,007,347 persons, as compared with 4,376,457 in 1907. The report, in referring to the projected extensions, remarks that the police consent had been obtained for the prolongation from the Spittelmarkt to the Alexander Platz, and to the Schonhauser Allee, and preparations for the construction of the lines were being continued. The section from the Gleidreick—the triangle where an accident took place several months ago—to the Wittenberg Platz, is at the request of the State authorities to be converted into a quadruple track as soon as possible, and the triangle will then form a junction station. It is proposed to continue both new tracks to the Nurnberger Platz, and an agreement has been concluded with the Wilmersdorf local authority, whereby the latter will construct a connecting line from Wilmersdorf to the Rastatter Platz, which is to be worked by the company. An application has been made for permission to build a line from the Alexander Platz along the Frankfurter Allee, and a surface or level section is also in contemplation from the Warschauer Brücke *via* Boxhagen-Rummelsburg to Lichtenberg.

Mountain & Gibson & Thornewill, Ltd.—We are asked to state that Messrs. Mountain & Gibson & Thornewill, Ltd., whose prospectus is now before the public, have recently secured contracts for rolling-stock and other manufactures from the Admiralty and the following towns and undertakings:—Bradford, Llandudno, Colwyn Bay, Costa Rica, La Plata Tramways, L.B & S.C. Railway, the Dock Works, Canada, Oporto (Portugal) and South Africa. The list of subscriptions for the issue at par of 60,000 shares of £1 each and 808 five per cent. debentures of £5 each, to which we referred last week, will close to-day.

MARKET QUOTATIONS.

Wednesday, May 26th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	„	28/-	..
a „ Sulphuric	„	5/6	..
a Ammoniac, Sal	„	42/-	..
a Ammonia, Muriate (crystal)	per ton	£33 10	..
a „ „	„	£30	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16	..
a Copper Sulphate	„	£20	..
a Lead, Nitrate	„	£25 10	..
a „ White Sugar	„	£23 10	..
a „ Peroxide	„	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a „ Chlorate	per lb.	3½d.	..
a „ Perchlorate	„	3½d.	..
a Potassium, Cyanide	„	7d.	..
a Shellac	per cwt.	77/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5	..
a Soda, Caustic (white 70 %)	„	£10 15	..
a „ Chlorate	per lb.	3½d.	..
a „ Crystals	per ton	£8 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
a „ Cyanide (basis 100 %)	„	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£70	..
b „ Wire, in ton lots	„	£112	..
b „ Sheet, in ton lots	„	£120	..
p Babbitt's metal ingots	„	£50 to £135	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7⅞d.	..
c „ Tube (brazed)	„	8⅝d.	..
c „ „ (solid drawn)	„	7⅛d.	..
c „ Wire, basis	„	6⅞d.	..
c Copper Tubes (brazed)	„	9⅝d.	..
c „ „ (solid drawn	„	9⅛d.	..
g „ Bars (best selected)	per ton	£73	..
g „ Sheet	„	£73	..
g „ Rod	„	£73	..
e „ (Electrolytic) Bars	„	..	..
e „ „ Sheets	„	..	..
e „ „ Rod	„	..	..
e „ „ H.C. Wire	per lb.	..	..
f Ebonite Rod	„	3/8	..
f „ Sheet	„	8/-	..
n German Silver Wire	„	1/6	..
h Gutta-percha, fine	„	5/6 to 6/6	..
h India-rubber, Para fine	„	5/6½	2½d. inc.
j Iron Pig (Cleveland warrants)	per ton	48/4½	¼d. inc.
l „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Ingot	„	£13 12 6	dec.
m Manganin Wire No. 28	per lb.	8/-	..
g Mercury	per bot.	£8 7 6	..
d Mica (in original cases) small	per lb.	6d. to 1s.	..
d „ „ „ medium	„	2/6 to 4/-	..
d „ „ „ large	„	4/6 to 8/6	..
p Phosphor Bronze, plain castings	„	1/- to 1/1	..
p „ „ rolled bars & rods	„	1/1½ to 1/3	..
p „ „ rolled strip & sheet	„	1/2½ to 1/6	..
o Platinum	per oz.	91/6	variable.
e Silicium Bronze Wire	per lb.	..	..
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£131 to £132	£1 dec.
n „ Wire, Nos. 1 to 16	per lb.	1/8½	..
p White Anti-friction Metals:—			
"White Ant" brand	per ton	£35 to £60	..
k Zinc, Sh't (Vielle Montagne bnd.)	„	£25 10	10/- inc.

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
j Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

Germany.—The balance sheet of the Accumulatoren und Elektrizitäts Gesellschaft (W. A. Boese & Co.), of Berlin, for the last financial year shows a net profit of £12,602, as compared with only £11,303 in the preceding 12 months. A dividend of 8s. per share is being declared.

France.—La Société Electro-Metallurgie de Dives reports a profit of £60,745 for the last financial year. A dividend of 22½ fr. per share is being declared, as compared with 20 fr. in the preceding 12 months.

Russia.—The balance sheet of the Société des Tramways et Eclairage Electriques de Saratov for the last financial year shows a profit of £16,767, as compared with £10,690 in the preceding 12 months.

Greece.—A dividend of 8½ per cent. is being paid for the last financial year by the Compagnie Hellénique d'Electricité, systeme Thomson-Houston, of Athens.

STOCKS AND SHARES.

Tuesday Afternoon.

SPECULATION has again ousted investment in the matter of activity, and the Kaffir Circus is aswirl with its volume of business. The heaviness of Consols induced by fresh streams of new issues, depresses all high-class securities, and the Home Railway market's only attempt at strength is to be found amongst the underground stocks.

Both Metropolitan and District Ordinary stocks are, however, below the best. The market being so limited, it takes very little selling or very little buying to move the prices sharply, and the recent bout of support being over, a few sales proved quite sufficient to lower the quotations. The pre-Ordinary stocks keep up well, and for the 6 per cent. Debenture stock of the District there are only buyers in the market, the price being nominally 142. Metropolitan Railway Preferences are also a good market; there are three kinds, all bearing 3½ per cent. interest. One is quoted at 90, the next, the "A" Preference, at 83, and the convertible Preference at 83 as well. The last is, perhaps, the most popular, carrying conversion rights that may possibly be of value in course of time, and affording a yield of 4¼ per cent. on the investment at the current price. East London stock rose to 3½ bid.

Canadian-Mexican issues have been somewhat upset by a newspaper attack upon the group in general. Prices have not moved to any appreciable extent; in fact, Mexico Trams are slightly better. Sentiment, however, is not so optimistic for the time being, and only Rio Trams made any headway against the prevailing dullness, the price in their case advancing 3¼ to 106¼, but afterwards reacting. The first mortgage bonds are ½ lower at 98, while the 5 per cent. 50-year mortgage bonds kept steady at 89½.

Anglo-Argentine Trams continue quietly to improve. London United Tramways Preference down-graded still further, and are now quoted at no better than 2⅜ for the £10 fully paid shares. It is worth noticing that London General Omnibus has fallen away to 31, and the £10 Preference shares are called 4½ middle.

London electricity shares are quite stagnant. Business has once more approached seriously near a standstill. What the industry wants, according to an expert in the business, is some new invention which shall secure to the companies an advantage equivalent to that which the metal-filament lamp endows the consumer with. From the market point of view, some fresh sensation of this sort would be very welcome.

Kalgoorlie Power Preference continue to harden, and are 16s., with many shares changing hands. The Ordinary have crept into favour at about 5s.

Telegraph stocks and shares have been somewhat irregular, but the tendency on the whole cannot be grumbled at by holders of the issues. Anglo-American Deferred spurted, and then gave way upon persistent selling. Eastern Telegraph Ordinary is better; Eastern Extension shares are firm. In the West Indian group there is not much movement. Marconi's have slightly declined.

American Telephone and Telegraph stock is fluctuating erratically, but on balance the buyers appear to be in a majority. National Telephone stocks quieted down considerably.

Manufacturing descriptions are mostly hard. Armament shares crept up a little further upon the announcement that Vickers and Armstrongs would receive orders for some of the new battleships of the "Dreadnought" class. Rubber shares are active, and the movements wild. After a sharp setback last week a strong rally occurred, followed by a fresh drop and once more by a recovery. The market is now a broad and fairly liquid one, but the absence of carrying-over facilities has much to do with the sharpness of the fluctuations in the prices of the shares.

Mirrlees, Bickerton & Day, Ltd.—The first annual meeting of this company was held at Hazel Grove recently, Mr. A. F. Baird presiding. The report for the period from the formation of the company (December, 1907) to March, 1909, showed a net profit of £3,213, after providing for depreciation, directors' fees and income-tax. £1,645 of this has been written off formation expenses, and £1,578 is carried forward. The erection of the works began in March, 1908, and they are now in active operation. Many foreign agencies have been negotiated, and some completed, and the directors look forward to a most successful year. Mr. Bickerton, in seconding the adoption of the report, said he was quite satisfied in his own mind, and he was prepared to back his opinion, both with his reputation as an engineer and with his capital, that before very long the Diesel engine would be considered almost necessary for every electricity generating station in the country, and he did not believe that any such station would be considered complete unless fully one-third of its power consisted of Diesel oil engines.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations May 18th.	Closing Quotations May 25th.	Business done week ended May 25th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2¾ — 3¼	2¾ — 3¼	..	..	..	Nil.
186,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	5 %	93 — 95	94 — 96	..	..	+1½	5 4
$121,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	8 %	8 %	8 %	143½ —144½	142 —143	..	..	—1½	5 11 11
$68,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	98½ —100½	98½ —100½	..	..	..	3 19 7
598,180	Anglo-American Telegraph	Stock	3½%	3½%	3½%	£3 4s.	58 — 60	58 — 60	58½	..	..	5 5 7
2,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	101½—102½	101½—102½	102½	101½	..	5 17 1
2,200,910	Do. do. do. Deferred	Stock	½%	1½%	1 %	8/-	17½ — 17⅞	17⅝ — 17⅞	17⅞	17½	+ ⅛	2 4 0
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	98 —100	99 —101	..	..	+ 1	4 19 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	8 — 8⅜	8 — 8⅜	..	..	..	4 15 6
2,431,350	Commercial Cable Sting. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	91½ — 93½	91½ — 93½	93	92½	..	4 5 7
16,000	Cuba Telegraph	10	5 %	5 %	6 %	6 %	8½ — 9	8½ — 9	..	..	..	6 13 4
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	17 — 18	17 — 18	..	..	..	5 11 1
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3 — 3¼	2⅝ — 3⅜	..	..	— ⅛	5 3 8
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8½ — 9	8½ — 9	..	..	..	5 11 1
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 16 6
60,710	Direct United States Cable	20	4½%	4½%	4½%	4½%	12½ — 13½	12⅝ — 13⅛	13⅛	12⅝	..	6 8 4
48,000	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	100½—102½	101 —103	..	..	+ ½	4 7 5
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	133 —135	133 —135	134½	133½	..	5 3 8
2,000,000	Do. 5½ % Pref. Stock	100	5½%	5½%	5½%	5½%	85½ — 87	85¼ — 87 xd	86⅜	85⅜	..	4 0 6
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	102½—104½	103 — 105	104⅛	103½	+ ½	3 16 2
800,000	Eastern Extension, Australasia, and China Tele	10	7 %	7 %	7 %	7 %	12½ — 12⅝	12½ — 12⅝	12½	12⅜	..	5 9 10
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	101 —103	101½—103½	..	..	+ ½	3 17 4
200,000‡	East & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	99 —101	99 —101	..	..	..	3 19 3
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	..	10⅞ — 11⅛	10⅞ — 11⅛	10⅞	10⅞	..	5 3 11
181,127	Do. do. 6 % Pref...	10	6 %	6 %	6 %	..	12⅜ — 13⅛	12⅜ — 13⅛	13⅛	12⅜	..	4 10 7
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	18%	27 — 28	27 — 28	27	..	..	6 8 7
14,800‡	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	100½ —102½	101 —103	..	..	+ ½	4 7 5
17,000	Indo-European Telegraph	25	18 %	18 %	18 %	18 %	51½ — 53½	51½ — 53½	..	..	..	6 1 6
$41,380,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	78 — 82	78 — 82	..	..	..	4 17 7
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	73 — 76	73 — 76	..	..	..	5 5 3
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅛ — ⅜	⅛ — ⅜	..	..	—⅛	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	¾ — 1	¾ — 1	..	..	..	6 0 0
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	⅞ — 1⅛	⅞ — 1⅛	..	..	..	5 12 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107 —108½	107 —108½	108	105⅝	..	5 10 7
3,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	123½ —124½	124½ —124⅝	124½	123	..	4 16 2
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½ — 11	10½ — 11	..	..	..	5 9 1
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	5 %	6 %	6 %	10½ — 11	10½ — 11	..	..	..	5 9 1
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅜ — 5⅝	5⅜ — 5⅝	..	..	..	4 5 1
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100	98 —100	98⅝	98½	..	3 10 0
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	101⅛	..	..	3 18 5
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	8 %	1⅝ — 1⅞	1⅝ — 1⅞	..	..	..	5 6 8
50,000	Do. do. do. 6 % Cum. Pref... ..	1	6 %	6 %	6 %	6 %	1⅝ — 1⅞	1⅝ — 1⅞	..	..	..	5 1 1
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	88½	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
11,889‡	Reuter's	8	5 %	5 %	5 %	5 %	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	4 16 1
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	101½	..	..	4 8 3
3,088	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6⅞ — 7⅛	6⅞ — 7⅛	7⅛	6⅞	..	5 12 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5 — 5⅜	5 — 5⅜	5⅜	..	..	4 13 0
80,008	W. Coast of America, 1 to 80,000 & 53,001 to 53,008	2½	Nil	2½	2½	..	1¼ — 1⅜	1¼ — 1⅜	22/0	..	..	3 10 11
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	13½ — 14½	13½ — 13⅝	14½	13½	..	4 19 1
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	102⅜	102½	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅛ — ⅜	⅛ — ⅜	14/-	..	+ ⅛	Nil
84,568	Do. do. 6 % Cum. 1st Pref.	10	5 %	6 %	6 %	6 %	9 — 9½	9 — 9½	9⅛	..	..	6 6 4
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	15 %	8½ — 9½	8½ — 9½	9⅝	..	..	15 17 8
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800	100	5 %	5 %	5 %	5 %	101 —103	101 —103	..	..	..	4 17 1

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,007	5	8 %	8 %	9 %	10 %	9⅛ — 9⅜	9⅜ — 9⅝	9⅝	9⅛	+ ⅛	5 0 8
960,007	Do. 6 % Cum. Prefs., 1 to 260,007	5	5⅛%	5⅛%	5⅛%	6 %	6¼ — 6⅝	6¼ — 6⅝	6⅝	6⅛	..	4 14 1
978,280	Do. 4 % Deb. Stock	..	..	..	..	..	93 — 95	94 — 96	95	94	+1	4 6 6
200,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock	100	5 %	5 %	5 %	5 %	102 —104	102 —104	..	..	..	4 16 2
880,000	Babcock & Wilcox, 1 to 880,000	1	20 %	20 %	20 %	20 %	4⅛ — 4⅜	4⅛ — 4⅜	91/3	88/9	..	4 9 11
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅜ — 1½	1⅜ — 1½	..	..	..	4 0 0
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	⅝ — 1⅜	⅝ — 1⅜	..	..	..	25 2 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	2 — 2½	2 — 2½	..	..	..	14 0 0
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	3½ — 4	3⅝ — 4	..	..	..	7 10 0
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3½ — 4½	3½ — 4½	..	..	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	95 —100	95 —100	..	..	..	5 10 0
500,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	8 %	8 %	142 —146	142 —146	..	..	..	5 9 7
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	5 %	6 %	123 —127	123 —127	..	..	..	4 14 6
800,000	Do. 5 % Cum. Perp. Pref. Stock ..	100	5 %	5 %	5 %	5 %	109 —112	109 —112	110½	..	..	4 9 2
328,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	101 —103	101 —103	104	..	..	4 8 6
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	102 —105	100	..	+1	4 5 9
138,301	British Electric Traction	10	3 %	Nil	Nil	..	⅜ — 1⅛	⅜ — 1⅛	20/3	17/6	..	Nil
161,487	Do. do. 6 % Cum. Pref.	10	6 %	6 %	8 %	..	2⅜ — 3⅛	2⅜ — 3⅛	6s/6	58/9	..	8 17 2
1,478,658	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	85 — 89	89 — 93	90	88½	+4	5 7 6
528,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	65 — 70	68 — 72	..	..	+2½	6 5 0
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	10 %	7⅛ — 7⅜	7⅛ — 7⅜	7⅜	..	+ ⅛	6 9 0
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6⅛ — 6⅜	6⅛ — 6⅜	6⅜	..	+ ⅛	4 7 3
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	105 —108	105 —108	..	..	..	4 8 4
304,917	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	91 — 96	91 — 96	..	..	..	4 18 11
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	⅛ — ⅜	⅛ — ⅜	..	..	..	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	40 — 44	40 — 44	..	..	..	9 1
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	⅛ — ⅜	⅛ — ⅜	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	3½%	Nil	Nil	Nil	0 — ⅛	0 — ⅛	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	Nil	0 — ⅛	0 — ⅛	..	..	..	Nil
125,000‡	Do. do. 4½ % Perp. Deb. Stock	Stock	4½%	4½%	4½%	4½%	43 — 48	43 — 48	..	..	..	9 8 6
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	29 — 33	29 — 33	..	..	..	13 12 8
137,610	Calcutta Trams, 1 to 137,610	5	8 %	8 %	6 %	..	4⅜ — 4⅝	4⅜ — 4⅝	93/9	..	+ ⅛	6 6 4
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,320..	5	5 %	5 %	5 %	5 %	4⅜ — 5⅛	4⅜ — 5⅛	5⅛	..	..	4 15 3
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	99 —102	100 —103	..	..	+1	4 7 5
35,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9⅝ — 10⅜	9⅝ — 10⅜	10	..	..	7 4 7
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅛ — 5⅜	5⅛ — 5⅜	5⅜	..	..	4 8 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock.	Stock	4½%	4½%	4½%	4½%	105 —107	105 —107	..	..	..	4 4 1
491,222	Cape E Trams., 1 to 491,222	1	Nil	Nil	Nil	..	⅛ — ⅜	⅛ — ⅜	38/9	36/9	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1⅝ — 1⅞	1⅝ — 1⅞	..	..	+ ⅛	6 8 7
210,158	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	102 —106	102 —106	..	..	..	4 4 11
1,896,610	Central London Railway, Ord. Stock	Stock	4 %	4 %	3 %	3½%	69 — 71	68 — 70	70	68½	—1	4 12 10
658,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	85 — 87	85 — 87	86	..	..	4 12 0
658,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	53 — 54	53 — 54	53⅜	53	..	4 12 7
1,480,000	City and South London Railway	Stock	1⅞%	3½%	3½%	1½%	31½ — 32½	31½ — 32½	32¾	31½	..	4 12 4
85,000	Crompton & Co., Nos. 1 to 85,000	5	2½%	5 %	5 %	5 %	1 — 1⅛	1 — 1⅛	..	..	..	9 7 6
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	96 — 98	96 — 98	..	..	..	5 2 0

* Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations May 18th.	Closing Quotations May. 25th.	Business done week ended May 25th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1⅛ — 1¼	1⅛ — 1¼	..	..	..	7 12 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	4 16 0
276,880	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	6 %	13 — 14	13 — 14	..	..	..	4 5 9
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	4½%	4½%	4½%	..	¼ — ⅜	¼ — ⅜	..	..	..	25 0 0
17,189	Do. "A" shares, 01—017,189	5	4½%	4½%	4½%	..	1¼ — 2⅛	1⅛ — 2⅛	..	..	..	8 6 9
317,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	70 — 75	70 — 75	..	..	..	5 6 8
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	84 — 87	84 — 87	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	⅛ — ¼	⅛ — ¼	7/-	..	— ⅛	Nil
81,890	Do. do. 7 % Cum. Pref., 1 to 81,890	2	7 %	7 %	7 %	7 %	1 — 1⅛	1 — 1⅛	21/3	..	— ⅛	11 4 0
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7⅞ — 7⅞	7⅞ — 7⅞	..	..	..	6 9 0
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	85 — 88	85 — 88	..	..	..	4 10 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	1½%	Nil	⅜ — ½	⅜ — ½	..	..	+ ⅛	6 13 4
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½ — 10¾	10½ — 10¾	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15 %	15%	15 %	11⅜ — 12⅜	11⅜ — 12⅜	12 7/10	11⅜	..	6 1 2
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	4⅜ — 5½	4⅜ — 5½	..	..	..	4 5 9
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	106 —108	106 —108	..	..	..	4 5 9
50,000	India-Rubber, Gutta-percha & Telegraph Works.	10	10%	10 %	10 %	10%	14½ — 15½	14½ — 15½	14 1/8	..	..	6 11 2
27,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	½%	Nil	⅛ — 1	⅛ — 1	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5 — 6	5 — 6	..	..	..	8 6 8
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	Nil	2 — 3	1½ — 2½	..	..	— ½	4 8 11
399,980	Do. do. 50,008 to 100,000	10	3 %	3 %	3 %	Nil	3½ — 4	3 — 4	..	..	— ½	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	3⅜%	2½ — 3⅛	2½ — 3⅛	60/-	..	— ⅛	11 10 10
1,881,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	71 — 75	70 — 74	..	..	—1	5 8 1
5,782,062	Metropolitan Consolidated	100	2⅜%	1 ½%	1½%	3⅜%	39⅜ — 40½	39 — 39½	40	38 1/16	— ⅜	1 5 2
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	70 — 72	70 — 72	70⅜	70	..	3 16 5
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	17½ — 17⅝	16½ — 17	17 1/16	16⅜	— ⅜	Nil
891,887	Metropolitan Electric Trams., Ord.	1	..	..	..	4½%	⅜ — ½	⅜ — ½	..	..	..	..
814,016	Do. do. Defd.	1	Nil	Nil	Nil	Nil	⅜ — ½	⅜ — ½	..	..	..	Nil
600,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	15/16 — 31/32	15/16 — 31/32	15/6	..	..	5 19 5
600,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	96 — 98	97 — 99	97½	..	+1	4 10 11
£6,000,000	Mexico Trams Co., Common Stock	..	..	..	..	..	143½—150¼	151 —152	153½	149	+2	..
£9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	5 %	96⅛ — 97½	96⅛ — 97½	97⅜	96⅛	..	5 3 1
245,500	Potteries Electric Traction	1	4 %	4 %	4 %	Nil	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	8 18 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	⅜ — ½	⅜ — ½	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	88 — 91	88 — 91	..	..	..	4 18 11
87,350	Telegraph Construction and Maintenance	12	15 %	15 %	17½%	15 %	32½ — 34	32½ — 34	33	..	..	6 0 0
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	101 —103	101 —103	102½	101½	..	3 17 8
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	101 —102	101 —102	..	..	..	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	87 — 89	88 — 90	..	..	+1	5 0 0
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	35 — 37	36 — 38	36½	..	+1	..
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	5	Nil	Nil	10 %	Nil	⅜ — ½	⅜ — ½	..	..	..	..
66,666	Do. 5 % C.P., 80,001 to 80,000 & 125,001 to 141,666	1	Nil	..	6 %	6 %	2⅞ — 3⅛	2⅞ — 3⅛	60/-	57/6	..	7 14 10
246,404	Do. % 1st Mort. Deb. Stock		4 %	4 %	4 %	4 %	78 — 82	78 — 82	..	..	..	4 17 7

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000		5½%	5½%	5½%	5½%	4⅛ — 4¾	4⅛ — 4¾	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 13 9
80,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	10 %	8¾ — 9	8½ — 9	..	..	..	5 11 1
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	8 — 8½	8 — 8½	8 1/8	..	..	4 2 4
886,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	5 14 3
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛ — 4¼	4⅛ — 4¼	..	..	..	4 12 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅞ — 4¼	3⅞ — 4¼	..	..	..	5 5 11
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	98 —101	98 —101	..	..	..	3 19 3
49,486	Chelsea Electricity Supply, Ord.	5	6 %	4½%	4½%	4½%	3⅞ — 4⅛	3⅞ — 4⅛	76/3	..	..	5 9 1
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10¾ — 11	10¾ — 11	10⅝	10 21/32	..	5 9 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11⅝ — 12⅛	11⅝ — 12⅛	..	..	..	4 16 0
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 —123	121 —123	..	..	..	4 1 4
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2⅞ — 3⅛	2⅞ — 3⅛	..	..	..	5 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3¼ — 3⅜	3¼ — 3⅜	..	..	..	6 13 4
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	96 — 98	96 — 98	..	..	..	5 2 0
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	8⅜ — 8⅞	8⅜ — 8⅞	..	..	..	5 14 3
50,997	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	10⅞	..	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	106 —109	106 —109	..	..	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	99 —102	100 —103	..	..	+1	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	8 %	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	60 — 63	60 — 63	..	..	..	7 2 10
$8,150,000	Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds.	$500	..	..	..	5 %	88 — 90	88 — 90	90½	89½	..	5 11 1
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4½ — 5	4½ — 5	..	..	..	5 10 0
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	5 — 5½	5 — 5½	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	97 — 100	97 —100	..	..	..	4 10 11
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	8½%	7⅞ — 7⅞	7⅞ — 7⅞	..	..	+ ⅛	5 9 8
$2,400,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	99 —101	99 —101	100½	..	..	5 4 11
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	8 %	7⅞ — 7⅞	7⅞ — 7⅞	..	..	..	6 1 3
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 2 6
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½%	3 %	1⅞ — 2⅛	1⅞ — 2⅛	41/8	..	..	4 16 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	5 — 5⅜	5 — 5⅜	5 3/32	5⅛	..	5 11 8
874,896	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½%	4½%	4 %	92 — 96	92 — 96	..	..	..	4 3 4
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½%	5 %	4⅜ — 5	4⅜ — 4⅝	..	..	— ⅛	5 5 3
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	4 5 9
230,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	107 —110	107 —110	..	..	..	4 1 10
248,000	Do. 5% Mort. Deben. Stock Redeem.	Stock	5½%	5½%	5½%	5½%	85 — 88	85 — 88	..	..	..	3 19 7
$5,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	89 — 90	89¼ — 90½	90½	89⅞	+ ⅛	5 10 6
18,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	3½%	77 — 79	76¼ — 78½	77⅝	77	— ⅛	4 9 2
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	114½—114¾	113 —115	114½	113½	+ ⅜	6 1 9
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	92 — 93	92⅜ — 93⅜	93⅛	92½	+ ⅛	5 6 8
350,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	2½%	4⅜ — 5	4⅜ — 5	..	..	..	2 10 0
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	4¼ — 5¼	4¼ — 5¼	..	..	..	4 15 3
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	99 — 101	99 —101	..	..	..	..
10,869	Notting Hill Electric Lighting	10	7½%	7½%	7½%	7 %	11⅛ — 12⅛	11⅛ — 12⅛	..	..	..	5 12 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	6 — 6½	6 — 6½	..	..	..	5 7 8
80,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	2½%	6 %	8 %	1⅜ — 1½	1⅜ — 1½	21/-	..	..	5 6 8
100,000	Do. do. 6% Non Cum. Pref. Nos.1 to 100,000	1	6 %	6 %	6 %	6 %	1 — 1⅛	1 — 1⅛	..	..	..	5 6 8
194,684	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	102 —106	103 —107	106	..	+ 1	4 13 6
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	10 %	8⅞ — 9⅜	8⅞ — 9⅜	..	..	..	6 15 7
90,000	Do. do. 7 % Pref. 80,051 to 40,080	5	7 %	7 %	7 %	7 %	7 — 7½	7 — 7½	..	..	..	4 13 4
450,000	Do. do. 3½ % Deb. Stock Red.	100	3 %	3½%	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
85,000	South London Electric Supply, Ord.	4	4 %	8 %	4 %	5 %	2¼ — 3⅛	2¼ — 3⅛	60/-	..	..	6 9 0
20,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	2½%	1 — 1⅛	1 — 1⅛	7/6	..	..	4 8 11
142,988	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅛ — 1⅛	1⅛ — 1⅛	..	..	..	5 6 8
220,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 0 0
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	⅝ — 1	⅝ — 1	..	..	..	25 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	2 — 2½	2 — 2½	..	..	..	10 0 0
75,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 84	80 — 84	..	..	..	5 7 2
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	5 %	2⅝ — 2¾	2⅝ — 2¾	..	..	..	..
110,000	Westminster Electric Supply, Ord.	5	18 %	12 %	10 %	10 %	9⅜ — 9¾	9⅜ — 9¾	9¾	19 9½	..	6 11 2
81,279	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5⅛ — 5⅜	5⅛ — 5⅜	5⅛	5 5/16	— ⅛	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank rate of Discount 2½ per cent.. April 1st. 1909.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING APRIL, 1909.

Once more we have to record a return to very high figures in the export section of these returns.

The export total for the month of April amounted to £297,690, and deducting the telegraphic business, in order to compare with returns prior to November last, the total was £246,798. Both these amounts have only once previously been exceeded, and compare with March totals of £271,814 and £224,920 respectively. In the import section, the total of £138,762 represents a drop of some £21,000 on the previous month, and, indeed, is somewhat below the average; re-exports, on the other hand, show a revival, totalling £13,491 during the month.

Of the individual export items, electrical machinery, with £135,111 standing to its credit, shows very satisfactorily; cables and telegraphic material are somewhat better, and telephonic exports are practically stationary. The import section shows a general decrease all round, with the important exception of lamps, which have gone up to £47,095 in value for April.

Prominent purchasers were much as in previous months, *i.e.*, India, Japan, South America, South Africa and Australasian Colonies, &c., while Germany, with a total of over £80,000 worth of imports, takes the premier position in that section.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Country receiving exports and importing.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric lamps and parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	122	1,317	34	103	2	7,031	84	10	...	93	1,924	10,720
Germany	364	120	19	10	102	635	75	14	15	41	2,073	3,468
Netherlands	302	1,110	224	44	40	747	...	69	...	158	38	2,732
Belgium	45	24	23	44	119	800	...	42	...	808	267	2,172
France	101	...	110	292	122	842	70	...	...	14	...	1,551
Switzerland	3	...	...	...	...	5	96	...	...	...	...	104
Portugal, Azores, Madeira & Portuguese Africa	44	540	4	50	420	138	17	10	...	22	1,480	2,725
Spain and Canary Isles	175	...	10	175	...	279	...	17	...	11	50	717
Italy and Austria-Hungary	252	38	25	81	153	8,025	768	...	...	...	116	9,458
Greece, Bulgaria, Roumania and Turkey ...	92	...	41	...	5	134	210	120	...	...	38	640
Channel Isles, Gibraltar and Malta	82	159	6	30	147	315	...	...	14	20	13,863	14,636
U.S.A., Philippines and Cuba	416	...	62	169	190	1,213	...	...	...	...	5,263	7,313
Canada	148	4,913	23	320	304	2,436	...	241	50	1,669	357	10,461
British West Indies and British Guiana ...	6	...	98	36	...	43	..	...	25	3	...	211
Mexico, Gautemala, Colombia and Panama ...	8	37	...	65	...	...	...	250	...	...	65	425
Peru and Uruguay	38	19	36	205	...	364	...	18	...	117	28	825
Chile	19	393	143	429	131	1,372	...	33	16	8	850	3,394
Brazil	159	569	142	203	392	5,133	841	91	8	900	1,641	10,079
Argentine	1,512	2,088	32	613	62	7,714	...	2,183	38	2,065	3,923	20,230
Egypt and Tunis...	205	154	41	64	12	511	24	34	2	1,388	4,130	6,565
British West Africa and St. Helena	8	2.6	12	14	11	135	...	59	...	31	284	887
Cape of Good Hope	292	4,067	59	99	...	4,183	83	56	...	21	198	9,058
Natal	863	6,050	78	378	67	3,397	...	103	...	44	29	11,009
Rhodesia, Orange River Colony and Transvaal	1,808	49	25	42	12	2,158	...	158	69	695	119	5,135
Zanzibar, Brit. East Africa, Mauritius and Aden	3	66	...	...	...	10	...	5	...	26	12,135	12,245
China and Siam	1,070	2,140	31	745	...	635	99	567	17	...	1,069	6,373
Japan and Korea...	45	1,796	17	...	819	28,653	3,136	...	...	1,541	456	36,463
India	2,554	12,296	4,535	922	538	17,570	1,484	1,921	94	375	172	42,459
Ceylon	25	250	36	61	...	98	8	116	...	45	...	639
Straits Settlements and Fed. Malay States	185	1,663	50	67	40	824	890	24	...	34	99	3,876
Hong Kong	156	336	16	87	14	733	101	24	...	25	...	1,492
West Australia	499	788	9	109	..	615	9	8	16	...	...	2,053
South Australia	373	865	11	210	37	723	...	1,200	...	234	...	3,653
Victoria	593	765	19	191	46	589	479	429	...	1,042	...	4,153
New South Wales	2,695	1,434	83	1,180	279	24,616	169	94	...	2,666	225	33,441
Queensland	3	...	...	...	...	4,164	...	...	...	86	...	4,253
Tasmania	32	...	...	...	...	16	...	...	...	...	...	48
New Zealand	188	1,892	145	284	335	8,255	362	210	40	316	...	12,027
Total, £	15,562	46,194	6,199	7,322	4,399	135,111	9,003	8,106	404	14,498	50,892	297,690

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

	£	£	£	£	£	£	£	£	£	£	£
Norway, Sweden and Denmark	242	...	40	...	...	744	...	545	10	6,022	7,603
Germany	535	10,078	1,745	40,471	2,506	13,897	...	132	4,409	6,442	80,215
Holland	18	17	...	2,170	4	657	38	110	...	35	3,049
Belgium	637	1,062	150	45	...	987	35	264	260	6 951	10,391
France	...	...	812	3,442	560	86	...	2,639	2,780	3,107	13,426
Switzerland	14	...	...	92	116	716	...	16	49	359	1,362
Italy	136	390	...	49	...	598	50	...	...	595	1,818
Austria-Hungary...	54	420	5	439	14	12	...	18	2,096	148	3,206
United States	1,879	30	650	387	217	10,513	2,934	350	437	295	17,692
Total, £	3,515	11,997	3,402	47,095	3,417	28,210	3,057	4,074	10,041	23,954	138,762

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

	£	£	£	£	£	£	£	£	£	£	
Various countries, mainly as above	1,393	313	...	4,810	...	2,548	...	425	329	3,673	...

Total Exports: £297,690. **Total Re-Exports: £13,491.** **Total Imports: £138,762.**

Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

ENGINEER'S DEPT. v. ACCOUNTANT'S DEPT.

By "INTERESTED."

That vexed question of a Council's electrical department working in unison with that of the accountant has been the cause of many heated words in the past, and yet will be the means of many more in the future.

For the benefit of those interested I give herewith a rough outline of the system adopted in a metropolitan borough. Although it works fairly well in practice, I do not suggest that better arrangements could not be made.

The main points are—all payments are actually made, and all moneys received, by the accountant, at the town hall.

Let us take payments first. The procedure is as follows:—All goods are ordered from the generating station, and the invoices naturally follow to the works. Directly upon receipt of the invoices they are entered in a rough summary

Date received.	No.	Date passed to Storekeeper.	Date received from Storekeeper.	Date passed on to Engineer.	Date received from Engineer.	Particulars	£ s. d.

Fig. 1.

book (fig. 1), when a number is given to each for the purpose of tracing it later. At the end of each day they are entered in their respective places in a general "bought" ledger (fig. 2), and then passed on to the storekeeper for the purpose of checking the quantities, weights, sizes, &c. Next day they are returned to the office, the charges checked, and passed on to the engineer to whose department

Name.....

Address.....

	Dr.					Cr.					
Date.	Particulars.	£	s.	d.	£	s.	d.	Date.	Order No.	Invoice No.	Particulars.	£	s.	d.	£	s.	d.

Fig. 2.

the account refers, for his signature. Afterwards the chief engineer finally passes them by placing his initials on each. When so passed, the accounts are entered on the Dr. side of the ledger, as though being paid, and forwarded to the accountant, who presents them at the next committee meeting for payment in the usual way. Once they leave the works they are considered to all intents and purposes as paid, and after that time, should any communications be received respecting the payment of such accounts, the creditors are, in a written reply, referred to the accountant's department.

Turning to the receipts, these can be divided into two headings: (1) energy sold, (2) goods supplied and work done. In the case of the former, the meters are read and accounts made up on a card system by the works' own staff. The account cards are kept in drawers each possessing locking arrangements, so that no cards can be abstracted by unauthorised persons. At the end of each month or quarter, as the case may be, these drawers, with the necessary cards locked in them, are sent to the accountant's department, and the actual invoices for energy are issued from there to the consumers. Also, one of the staff from the town hall puts in a certain amount of time as collector. Any payment made at the works is forwarded to the accountant direct for him to deal with, no record whatever being made by the engineering staff.

When instances occur of goods being sold or any work done for customers, payment is sometimes made to the electricity works but in every case the cheque, P.O., or whatever is received, is forwarded to the town hall as soon as convenient.

From these remarks it will be gathered that the electricity department carries out all of what might be termed the technical part of the business, and the accountancy department all the real book-keeping. Evidently this arrangement necessitates a certain amount of duplication, which should be unnecessary, but, under the circumstances, the system could not be vastly improved.

Outsiders have been heard to remark how peculiar it is that the staff of the accountant should be accused of making so many "howlers," whilst those on the engineer's staff should be exempt from similar errors when dealing with accountancy work. The reason is not far to seek. Whilst the accountant's staff stick to books, accounts, &c., all goes well, but it is when they venture to use technical terms and phrases in conjunction with their work, such as "nominal candle-power," &c., that they make "howlers." Quite the reverse is the case with the works office staff. They usually possess a sufficient smattering of engineering, together with a general knowledge of accountancy work, which enables them to steer clear of such "howlers" when dealing with the accounts of the department.

Of course, no person is infallible, but where the "juice works" staff sometimes score occasionally is when, like "Brer Rabbit," "he lay low and think."

REVIEWS.

The Internal Combustion Engine. By H. E. Wimperis, M.A. London: Archibald Constable & Co., Ltd. 1908. Price 6s. net.

This work claims to be a text-book on gas, oil and petrol engines, for the use of students and engineers. In the preface the author says: "It is remarkable that there should be no English text-book on the subject of the internal combustion engine." . . . "The present book is an endeavour to fill this gap." . . . "It is hoped, therefore, that the student will be helped to understand something of the applications of those heat engines which work on the internal combustion principle, and the practical engineer to a better realisation of the scientific principles concerned in the design and working of gas, oil and petrol engines."

Reviewing the work on the lines of the author's claims, we have all previous works, by other writers, excluded from consideration as English text-books, and the present work presented as the first attempt! Also its range of utility is assumed to include the requirements of the engineer, as well as of the student, and this in some 320 pages.

The principal section deals with theory, including thermodynamics and combustion, occupies about one-third of the work, and is certainly a very clear exposition of the heat effects occurring in internal combustion engines, and their relation to the efficiency to be obtained, as far as the most recent experiments by eminent workers have contributed to the science.

The difficulties surrounding the determination of the specific heat of gases at high temperatures are so involved that, although the author very ably reviews the experiments of modern experts, the first report of the Gaseous Explosions Committee of the British Association was only issued as the book was going to press, so the author has added an appendix giving the modifications of his equations in accordance with the conclusions of the Committee.

Fifty-seven pages are devoted to the gas engine, and include descriptions of some of the most recent types of two and four-cycle engines, both horizontal and vertical. Engineers and designers will probably be disappointed at the absence of tables giving the thermal value and specific heat of gases, proportions of the details of engines, such as crankshafts, &c., the matter being more of a general description than of a practical character. The governing of internal combustion engines has received much attention from engineers, but only a single page is devoted to this subject, a notable omission being Letombe's work in perfecting quantitative governing.

The section on gas producers, occupying 84 pages, after briefly dealing with the theory of gasification, describes generally the different types of producers, but deals more particularly with the suction type.

On page 197 the problem of the application of suction gas producers to the gasification of bituminous coal is thus briefly disposed of:—"The chief difficulty is to devise a suction producer which will work with bituminous or coking coal without the necessity of being provided with apparatus for the extraction of tar and other by-products. . . . It is therefore necessary to arrange the producer so that all the tar produced is consumed before it leaves the producer. This can be done by feeding in the fresh fuel from below, so that the heavy hydro-carbons given off from it are consumed as they rise into the hotter part of the fire." However, particulars of the satisfactory bituminous coal gas producer are not given in this work other than those requiring considerable gas cleaning apparatus, such as tar extractors, &c.

The section dealing with blast-furnace and coke-oven gases gives some very interesting particulars of the application of this class of fuel for cheap power production, but the reviewer is not able to join with the author in anticipating an enormous demand for calcium carbide to be used in the preparation of chemical manure, even with very low cost of power; the very cheapest carbide would have to be further treated for its conversion to calcium cyanamide.

Chapters VIII and IX deal with "Oil and Petrol Engines" and "Petrol Engine Efficiency and Rating"; and as far as the 97 pages will allow, the subject is well treated and deals with the latest practice.

Owing to the rapid progress made in developing the theory and practice of the internal combustion engine within recent years, the present work, though it may fall short of its claim as the *only* text-book, will be found of great assistance to students engaged in the study of thermodynamics, as well as a record of the advances in efficiency and reliability that such knowledge and investigation has resulted in procuring.

Electrical Engineers' Pocket-Book, 1908. By H. A. Foster. London: Constable & Co. Price 21s. net.

The fifth edition of this work exceeds the previous editions in magnitude by about 600 pages, and the subject matter of every section has been either completely revised and brought up to date, or entirely rewritten. The aim throughout has been to supply in exhaustive and condensed form the data essential to the engineer engaged in any of the branches of the vast domain of electrical engineering. The author believes that a state has now been reached in the science such that the present volume will require little future alteration, *i.e.*, that the essential facts of standardisation will hold for all time, and that anything to come will be by way of embellishment rather than of fundamental alteration of principle.

The plan of the work has not been altered. Each section has been revised as before by a specialist in that particular field. Each section is self-contained, and needless repetition has been avoided by an extensive use of cross-references. A large amount of new matter has been added, some of it appearing for the first time in print. In the section on conductance, for example, the tables of inductance, capacity, and impedance are new and original. Moreover, the matter has been confined to the requirements of the electrical trades and sciences, the inclusion of the usual mathematical tables and data found in the commonly-used hand-books having been avoided as they are easily accessible.

The book contains 1,600 pages, and requires a very large pocket indeed to house it comfortably. The sections are divided between electrical and mechanical.

The section on the use of electricity in the United States army is especially interesting, and includes notices of many appliances. We have several pages of descriptive matter given to searchlights along with well-drawn diagrams and tables of data; Boulange's chronograph for experimental work in determining the velocity of rifle bullets; the Schultz chronoscope; the Schmidt chronograph; the Squire-Crehore photo-chronograph; the motors in connection with the manipulation of coast-defence guns; the fuses for firing at a distance from the gun; defence mines and diagrams of the operating box on shore; fortress telephones and telegraphs; field telephones and telegraphs; the telautograph; wireless telegraphy; electric ammunition hoists; night sights; firing mechanism for rapid-fire guns, &c. There is much similar information given on the use of electricity in the navy, including a complete description of the generating sets, the wiring, the lighting, the signal lights, the power system, ammunition hoists, boat cranes, ventilating fans, water-tight doors, steering-gear, interior communication system, range finders, and so on.

The section on the electric automobile contains also some interesting and useful matter, especially a curve showing the relation between the tractive resistance and speed for various types of tires. Under electric cooking, &c., we have much information as to cost with the various systems. There are also tables giving costs for interior heating of electric tramcars.

The mechanical section is quite extensive and contains in itself almost as much matter as is to be found in pocket-books devoted exclusively to this side of engineering. Reviewed as a whole, this is the most extensive and remarkable pocket-book dealing with electrical engineering to be purchased to-day. It overwhelms by the immensity of its information, and though, perhaps, of little use to the student, will be found almost indispensable to the man who is engaged in the multifarious practical every-day work of the profession.

The Electrical Equipment of Collieries. By W. G. Duncan and D. Penman. London: Scott, Greenwood & Son. Price 10s. 6d. net.

We are convinced that there is room for a book on this subject, but we cannot say that the authors of the present work, in our opinion, have produced a book which will appeal to those engaged in colliery work, who have little or no knowledge of electrical engineering, in spite of the fact, as we are told in the preface, that "The authors have devoted their attention, firstly, to the inclusion of *sufficient electrical teaching* as may be presumed to be necessary for the training of a thoroughly practical and competent manager of a colliery." The italics are ours, and we venture to disagree with the authors that "sufficient electrical teaching" is contained in the volume under review. There is no more a "royal road" to the acquisition of electrical engineering knowledge, than there is to "mining engineering," and a colliery manager had better leave the subject alone rather than attempt to acquire a knowledge of electricity and its applications from the smattering of the subject contained in this work. The book contains 14 chapters, and some 154 illustrations, which, in nearly every case, are merely reproductions from makers' catalogues, or other publications, and much of the descriptive matter is also obtained from the same source. As a rule, the colliery manager has all this information before him, but has not the necessary technical knowledge to enable him to understand and criticise the various points raised in discussion or the advantages claimed for any special piece of apparatus or machinery; what is—we believe urgently—wanted is a work to supply this knowledge, which can only be written by an author with a thorough knowledge and considerable practical experience in colliery electrical engineering, and such a one must necessarily have had an electrical training.

Generally speaking, the electrical part of the work in question is weak, not always correct, and sometimes misleading.

Chapter 1, dealing with general principles, magnetism, units, cells, &c., is crowded into some 16 pages, and, naturally, justice cannot be done to these important items, which are so necessary to a clear understanding of the chapters following. On page 15 a diagram is given illustrating the connections for charging a battery of accumulators in parallel—though the meaning of the term "parallel" has not been previously explained—and though three ammeters are shown, no reference is made to them in the text, and no automatic switch is shown, or even mentioned as a necessary piece of apparatus in an installation of accumulators. Chapter 2, dealing with dynamos and motors, in our opinion

is even worse than Chapter 1, as this most important section comprises only about 23 pages. The principle of generation of current in a dynamo is dismissed in nine lines; a sketch which is not correct—inasmuch as one end of the "loop of wire" is shown connected to the spindle, instead of to the insulated collecting ring—and a few paragraphs contain all that is to be said on direct-current machines, and a few more finish alternating-current generators. The treatment is very inadequate, sometimes misleading, and the authors wisely refer the reader to "text-books" for "The Winding of Armatures." We are told, for instance, "a dynamo in its simplest form produces alternating current, but by introducing *certain windings* it is made to generate a current which is continuous," and "unlike continuous-current machines, in the modern type of alternating-current generator, the armature remains stationary," which, while perfectly true as regards the larger machines, is misleading as regards small generators. Again, in speaking of exciters, we read: "It is *obvious* that owing to the reversal of the intermittent current, it cannot be used for exciting purposes," but such a statement cannot be "obvious" to a reader without any technical knowledge, and if the reader is supposed to be sufficiently acquainted with electrical matters to know this, or has to refer to other works, why introduce the subject? The Lundell direct-current motor is described as something very unusual, because it has only one field coil, and "This coil supplies the exciting power where it is most needed—*i.e.*, as near the armature as possible." Surely the authors know that it is immaterial how many exciting coils are used, or how they are placed in relation to the armature. Again, the terms "motor-generator" and "booster" are assumed to have the same meaning, but there is a distinct difference between them. A motor-generator usually transforms the whole current, while the "booster" may only be a very small machine in series with the main generator to raise the voltage for a specific object. This should have been explained.

We must pass over Chapter 3, "Transmission and Distribution of Power," which ought to be called "Cables and Switches"; Chapter 4, "Prime Movers"; Chapter 5, "Lighting by Electricity," none of which contain any information that can be said to be of real value to the colliery manager, as too much is attempted in too little space. The authors are more at home in the remainder of the work, though, as we have already remarked, this is spoiled by too free a use of catalogue literature. Such important questions as "Cost of Electrical Installations" and "Electricity applied to Coal Cutting" are dealt with, and much useful information is given, compiled from different sources, which cannot fail to be of use to the colliery manager. Chapter 8 deals with "Haulage and Winding," but could be much improved, and we cannot agree with the authors that "No mining engineer worthy of the name would, for a moment, think of upholding the steam-driven winding engine from the standpoint of economy." We have next "Electric pumps, electric drills, typical colliery installations, miscellaneous applications, comparison of different modes of transmitting power, and dangers from the use of electricity," the last two being very good indeed, and the work concludes with a few questions for students in the shape of an appendix. Whilst we do not agree with much of the authors' work, we have no desire to condemn all of it. Much, indeed, is both practical and useful, proving that the authors have considerable mining experience, though evidently lacking experience in the best practice of electrical engineering.

Exhaust Steam Turbines.—Messrs. Belliss and Morcom, Ltd., of Ledsam Street Works, Birmingham, inform us that they have had a 250-kw. turbine of their patent impulse type running in series with one of their triple-expansion reciprocating engines on their own shop load for 18 months, with a resulting economy of not less than 20 per cent. in coal alone; the turbine has run almost continuously on day load without stoppage for repair, and has not yet been opened for inspection. The special features of this turbine are the absence of close clearances, and consequently freedom from stripping; the attachment of the blades to a short drum instead of to disks, the drum being mounted on a through shaft; special mode of fixing blades; moderate speed, and ease of inspection. They claim to be the first engine manufacturers in this country to run their own shops with a reciprocating engine, turbine and condenser, all built in the same works.

THE ROYAL SOCIETY CONVERSAZIONE.

The first annual conversazione of the Royal Society was held at Burlington House on the 12th inst. A large number of exhibits of interest to physicists and electricians were on view.

Mr. T. H. Laby and Mr. Horace Darwin, F.R.S., exhibited a new string electrometer which consisted of a silvered quartz fibre stretched centrally between two vertical plates. Initially, the fibre is at zero potential, and (as exhibited) one plate at + 40 volts, and the other at − 40 volts. A change of potential of the fibre causes a lateral deflection of it which is measured by means of a micrometer microscope (× 300). The sensitiveness of the electrometer depends on (1) the distance of the plates apart; (2) their potential difference; (3) the tension of the fibre. As shown, the invar plates were 1 cm. apart. They may be brought as close as 3 mm. with a great increase of sensitiveness. By the use of invar plates, a geometrical knife edge, and a screw adjustment, the tension of the fibre may be quickly altered within a wide range, or be kept constant. A sensitiveness of 600 eye-piece divisions per volt has been obtained. The instrument is made by the Cambridge Instrument Co. Mr. Laby exhibited an application of this electrometer to the counting of α particles by Rutherford's method.

Mr. C. P. Butler exhibited the Thorp-Butler replica-grating spectroscope. Plane replica diffraction gratings have previously been produced by Thorp. In this exhibit the same method has been applied to the production of concave replica gratings. The celluloid replica is mounted on the back of a lens, and a dispersion equal to that of a very powerful spectroscope of ordinary construction is obtained at a small fraction of the cost.

Mr. Arthur Wright exhibited an electrical device for evaluating algebraical formulæ and equations. The device consists in the combination of special rheostats attached to slide rules and a Wheatstone bridge, by which quantities can be multiplied, divided, added or subtracted simultaneously, and by which complicated algebraical expressions or equations can be evaluated or solved with an accuracy comparable with that attainable by ordinary slide rules.

Sir William Ramsay exhibited a very minute quantity of liquid radium emanation. At ordinary temperatures the gaseous emanation liquefies to a colourless liquid of high density, which phosphoresces strongly. At about 70° the liquid freezes to a solid, which, when further cooled, phosphoresces with remarkable brilliancy.

Several interesting pieces of apparatus were shown by the National Physical Laboratory: an electrically-heated laboratory muffle furnace by W. Rosenhain, a quadrant electrometer for alternating-current power measurements, and a standard non-inductive water-cooled manganin tube resistance by Paterson and Rayner. In the quadrant electrometer, the moving system has a conducting suspension, and is connected to the pressure point of the circuit in which power is to be measured. The quadrants are connected across a standard resistance in the circuit, so that the P.D. across them is proportional to the current passing. The deflection is thus proportional to the power in the circuit. The scale for use with the wattmeter is 4 metres long and admits of an accuracy of two parts in 10,000 in the measurement of power.

Messrs. Paterson and Rayner also exhibited a metallic-filament electric glow lamp for use as a photometric standard. The lamp has tungsten filaments in one plane, and operates at 1·5 watts per horizontal candle.

An engine worked by stretched india-rubber was exhibited by Mr. A. Mallock. The model was intended to illustrate a method whereby a long stretched india-rubber cord can be made to produce mechanical work.

Prof. S. P. Thompson exhibited experiments on the contraction by heat of india-rubber, and standard magnets for quantometric work.

Dr. Waller's demonstration of the electrical variations of the human heart, and of the dog's heart, on an Einthoven string galvanometer, attracted a considerable amount of attention.

Mr. Francis Fox exhibited specimens of pitch blende from the Trenwith Mine, Cornwall, which contained 33 per cent.

of uranium oxide, and 150 to 200 milligrammes of radium per ton of ore. This appears to controvert the allegation often made that there was no radium in the Cornish pitch blende.

Dr. C. V. Drysdale exhibited a vacuum tube model showing the propagation of alternating currents in a helix, and an interesting stroboscopic apparatus for measuring speed, frequency, slip, and other periodic phenomena. In this latter apparatus a disk bearing a geometrical design (concentric square, pentagon and hexagon, and a 30-pointed star) is mounted on a rotating shaft and is viewed either through slits in shutters attached to a standard tuning fork or through radial slits in a disk which rolls on a cone rotated by a synchronous motor. By traversing the disk along the cone its speed can be uniformly varied, and one of the figures on the geometrical disk can be made to appear stationary. In this way a very accurate measure of speed of rotation can be obtained.

A remarkable demonstration was made by Messrs. Strange and Graham, Ltd., of a new process of making ribbon-metals. The molten metal is caused to flow through one or more nozzles in a thin stream on to the periphery of a rapidly rotating water-cooled drum. The metal solidifies immediately, and is thrown off from the surface of the drum in the form of a continuous and uniform ribbon. It is possible to obtain metal as thin as $\frac{1}{1000}$ in., and half a mile to a mile of ribbon can be obtained from each nozzle per minute. The process is applicable in the manufacture of white lead, metallic joint packings in water, gas and steam pipes, manufacture of thermit, &c.

THE NEW PATENTS ACT IN OPERATION.

ANOTHER case of considerable interest and importance to patentees who own, but have not worked, patents in this country, has been decided by the Comptroller-General of Patents. An application was made to revoke a patent relating to a small type setting, distributing and printing machine. The patentees were a company in New York, and the applicants for revocation were a firm of printers at West Bromwich.

Inasmuch as the question under consideration was whether the patentees had worked or attempted to work their invention in this country to a sufficient extent, it is necessary to look at the facts of the case with some care.

In August, 1908, they entered into a contract with Messrs. F. E. Baker, Ltd., of Birmingham, for the manufacture by them of 50 machines. These 50 had not been fully completed or put on the market, but ten of them were practically ready at the date of the hearing, and it was stated that the other 40 would be ready about the end of June. It was also proved that while Messrs. Baker manufactured the main structure of the machine, many of the smaller parts, such as screws, stampings and metal castings, were imported from America, but the whole machine was put together in England. The actual sale of machines imported into England had been 72 up to July, 1908, and 68 for the eight months since. The attention of the company was called to the provisions of the Act in January, 1908, and shortly after this instructions were sent to Mr. Stafford in England to find a suitable factory for making the machine here. As a result of this he had communicated with Messrs. Baker who had manufactured the 50 machines above mentioned. According to a report in the *Times*, the Comptroller-General in the course of his decision said :—

> I agree that at the date of the application in this case it would have been difficult to find any adequate manufacture, or, indeed, any manufacture in this country, but, after hearing the evidence, I think that I must hold that the contract with Messrs. Baker is a genuine contract, and that there is at the present time a manufacture of the machine in this country sufficient to meet a great proportion of the demand here. This by itself might not be enough, but, having regard to the particular facts of the case and the special character of the machine, I think that the reasons given in explanation ought to satisfy me. The special features of the case appear to me to be these: The machine is a particularly complicated one, which is sold at about £60, and is very useful for a special class of business. Such labour-saving machines for office work have always had a larger sale in America than here; and a demand for this particular machine does not appear to have arisen to any great extent in the United Kingdom. Secondly, the machine has been constantly improved. It was not perfect at the start, and I think it may be held that a patentee who endeavours to perfect his machine in his own country before selling it elsewhere, has claims to consideration. Further, although it is clear that the provisions of the Act of 1902 laid serious obligations to work on patentees, and that there may in principle be no distinction between patentees before and after the Act of 1907, yet, as the Act of 1902 was not strictly enforced in practice, I think I ought to apply a somewhat less rigorous standard to former patentees when it is a case of bringing forward satisfactory reasons for inaction. The patentees here, it is true, did nothing until March, 1908, but they then appear to have made genuine efforts to get a sufficient working to comply with the Act, and Mr. Stafford's contract with Messrs. Baker, under which the machines are now being made, was concluded in August, 1908, before the year of grace had elapsed. It is true also that the contract with Messrs. Baker is at present for 50 machines only, and need not be renewed, but, if it is not renewed, the applicants can come again to this Court, and there would then, I think, be no adequate answer to their application. Further, this is not, in my view, a case where I can order the patent to be revoked at some future date, unless the patentees prove adequate working in the interval. There is at this moment what may be said to be a substantial working, and in any case there will be in a few weeks, according to Mr. Baker's evidence, and no useful purpose would be served by giving a decision to revoke the patent at some future date, when there is evidence to show that there will be a satisfactory output of the patented article in a very short period . . . . This is not a case in which the only attempt to work is started after the application. In such cases I think a stricter and more rigorous application of the section would be necessary. It was stated that England was to be the seat of manufacture for those countries of the Eastern Hemisphere where patent rights do not exist, and a failure to carry out this promise may help to justify any future application.

Two or three points referred to in this judgment are of special interest. In the first place, the Comptroller says that a patentee who endeavours to perfect his machine in his own country before selling it elsewhere has claims for consideration. This appears to be a just principle which does not injuriously affect the British public. Again, the Comptroller lays it down that patentees who owned patents before the Act came into force are entitled to be treated with extra consideration. That, too, is a righteous principle. When an Act of Parliament is made retrospective in its action, it is calculated to interfere with vested interests. Patentees who had obtained their monopoly grants prior to 1907 never contemplated that they would have to take steps for their immediate working in England. The Comptroller also pointed out that if for any reason the arrangements made for working the patent should not be carried out, the applicants might come again and make complaint.

Following the example of Mr. Justice Parker in his famous judgment in the case of Hatschek's patent (see ELECTRICAL REVIEW, April 2nd, 1909, page 572), the Comptroller-General also enunciated certain general principles which are of considerable interest. He made it plain that mere good intentions on the part of the patentee who is accused of not working his invention in this country are not sufficient. He said :—

> It is not enough for the patentees to show in these cases that they have made genuine and *bond fide* efforts to carry out the obligations enforced on them by the Act: the standard to be applied is what a reasonable man, or a reasonable business man, should do in the circumstances. It is not enough for the efforts to be sufficient in the patentees' own estimation; they must conform to the standard which an intelligent business man in this country would place before himself and adopt.

Further, the mere fact that there is no demand for the patented article in this country will not be an excuse for non-manufacture. The Comptroller said :—

> The consideration of the adequacy of manufacture in this country does, no doubt, depend to some extent upon the demand existing for the article here or in neutral markets, but it does not follow that, if there is no demand existing, there is no obligation on a patentee to start an industry here. If the patentee does, in fact, manufacture in foreign countries, and if there is, in fact, a demand for the article or process abroad, the absence of any demand here does not seem to be a valid excuse. The patentee must, in such cases, make an effort to create a demand here, and the establishment of an industry will in itself help to create in many cases a demand for the article or process in question.

It may be remembered that, in the case already referred to, Mr. Justice Parker said that it could never be sufficient for a patentee defending himself under the section to prove that he could not now start an industry with any chance of profit. In the case now under notice, the Comptroller-General pointed out that a patentee cannot escape by merely alleging that English workmen are incompetent. He said :—

There may be exceptional instances in which it is the case that the patented article is a complicated and delicate piece of mechanism, many of the parts of which cannot be properly manufactured here, but the strongest evidence will be required to show that manufacturers and workmen of this country are incapable of turning out even the finest and most delicate machinery. A foreigner coming here to manufacture under the monopoly granted to him in this country cannot always hope, or expect to do so on the same terms as in his own country, and he cannot bring forward as a valid excuse for delay that he was unable to obtain terms which evidence might show to be unreasonable here.

PROCEEDINGS OF INSTITUTIONS.

Institution of Electrical Engineers.

The report of the Council presented to the annual general meeting on May 27th shows that the membership increased by 29 during the year, to 6,097. During the session the Council elected Mr. Oliver Heaviside and the Hon. C. A. Parsons as honorary members. The following premiums were awarded:—

Institution Premium (£25), Mr. J. H. Rider, for paper on "The Electrical System of the L.C.C. Tramways." Paris Electrical Exhibition Premium (£10), Messrs. L. Andrews and R. Porter, for paper on "The Use of Large Gas Engines for Generating Power." Extra Premiums (£10), Messrs. W. Cramp and B. Hoyle, for paper on "The Electric Discharge and Production of Nitric Acid"; Mr. T. Swinden, for paper on "Researches on the Magnetic Properties of a Series of Carbon Tungsten Steels"; Mr. E. A. Watson, for paper on "The Di-electric Strength of Compressed Air." Extra Premiums (£5), Mr. H. S. Hallo, for paper on "The Theory and Application of Motor Converters"; Messrs. J. C. Macfarlane and H. Burge, for paper on "Output and Economy Limits of Dynamo-Electric Machinery"; and to Mr. J. S. Peck for paper on "Fly-wheel Load Equaliser." Original Communication Premium (£10), Messrs. C. C. Paterson and E. H. Rayner, for communication on "Non-Inductive Water-cooled Standard Resistances for Precision A.C. Measurements." Students' Premiums (£10) to Messrs. B. E. Stott and J. Hargrove, (£5 each) to Mr. L. H. A. Carr, Mr. P. C. Jones, Mr. W. S. Lonsdale and Mr. C. S. Richards.

In conjunction with the Institution of Mechanical Engineers, a gold medal has been designed for presentation to recipients of the Willans premium, who may prefer the award in this form.

The Council entered into an agreement to complete the purchase of the Victoria Embankment premises for the use of the Institution, by June 1st, 1909.

It is proposed to enlarge and improve the entrance hall and lecture theatre; with the exception of the ground floor, which is reserved for the Institution, the remainder of the building has been let to the present owners for three years.

It is expected that the Institution will be transferred to the new premises in the autumn, and that the enlarged lecture theatre will be available early in 1910.

New wiring rules are being prepared which will contain modifications to meet the Home Office Regulations, and enable sanction to be given to less expensive methods of wiring, &c.

The Council has under consideration the subject of professional conduct and a qualifying examination for associate membership.

The Manipulation of Dry-Core Telephone Cables.

By F. G. C. Baldwin, A.M.I.E.E.

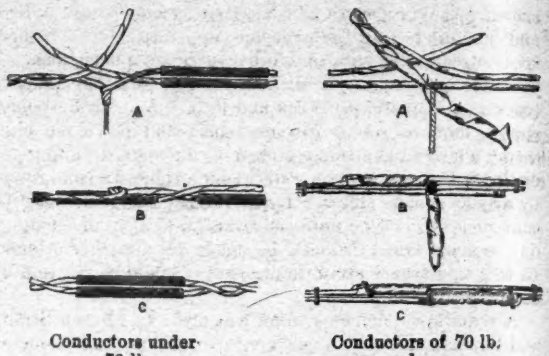
(*Abstract of paper read before the* Institution of Electrical Engineers, *at Birmingham, April 21st,* 1909.)

This paper describes the actual practice followed by the National Telephone Co. in connection with the laying of dry-core cables in ducts; owing to the loose way in which the wires are disposed inside the lead sheath, extreme care is essential to avoid injury to the sheath.

In drawing the cables in, hand hauling is restricted to short lengths of small cables; a manually-operated winch is the best appliance for general use. The attachment of the cable to the rope is a matter of considerable importance; a wire "grip" has been universally adopted for this purpose, consisting of a woven cylinder of steel wire, which is slipped over the end of the cable, and tightens up when hauling is commenced. When heavy lengths are being dealt with, it is sometimes advisable to open the end of the cable and plumb the conductors solid with the sheath for a few inches, to distribute the tension amongst the conductors, and to avoid risk of the sheath parting. The cable is lubricated as it enters the duct, and travels at a speed of 3 to 8 ft. per minute. In the case of great lengths of cable not exceeding 1½ in. in diameter, it is possible to avoid cutting and jointing by drawing in half the cable from a point halfway between the ends of the section, taking the rest of the cable off the drum and laying it on the ground in the form of a figure 8, and then drawing in the free end. In this way lengths of nearly 800 yd. have been successfully laid.

After a length of cable is laid it is tested for faulty wires; each wire is tested for continuity, and again for earth, contact and short-circuit. Faulty wires in consecutive lengths are joined together and labelled. In testing for contact, each wire is separately tested while all the rest, tested and untested, are earthed on the cable sheath.

In jointing, cleanliness and the exclusion of moisture are necessary. Fig. 1 shows the method of jointing pairs. Conductors under 70 lb. per mile are tightly twisted together, and insulated with a dry paper sleeve; larger conductors are insulated with their own paper covering, bound with cotton thread. In both cases the paper is included in the first two twists, to prevent it from running



Conductors under 70 lb. Conductors of 70 lb. and over.

Fig. 1.—Details of Jointing.

back, and the joint is not soldered. Wires of corresponding colours are joined together. The joints are distributed so as to secure uniformity in diameter, and after thorough drying, the whole joint is served with a binding of cotton tape without overlap, and plumbed with 6 lb. sheet lead or a sleeve. A brass nozzle is provided through which desiccated air is pumped into the joint, and

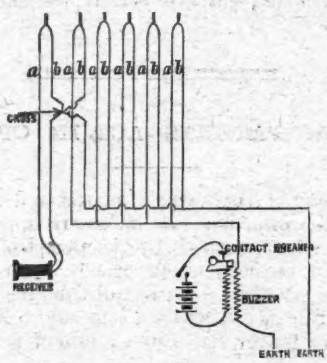


Fig. 2.—Test for Crossed Pairs.

any leakage is shown by the continued appearance of air bubbles on the application of soapy water.

Each pair is tested for crosses as jointed. Before commencing the first joint the extreme end of the first length of cable is opened, the individual pairs are very carefully selected, and the *a* and *b*

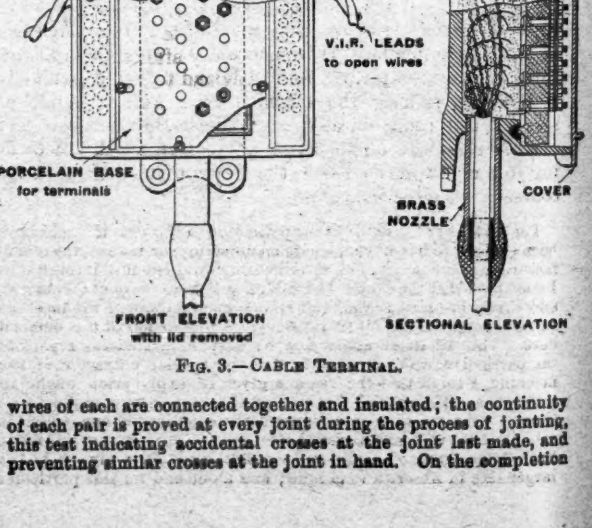


Fig. 3.—Cable Terminal.

wires of each are connected together and insulated; the continuity of each pair is proved at every joint during the process of jointing, this test indicating accidental crosses at the joint last made, and preventing similar crosses at the joint in hand. On the completion

of the jointing a rough test of the section for faulty wires is desirable.

Every completed section is further tested for crossed pairs which may have escaped notice, as in fig. 2. An alternating current is sent round the whole of the pairs connected in parallel, and each pair in turn is individually connected to a telephone receiver, a hum in which indicates a cross. Any crossed pairs that may be found are labelled, and on completion of the test are either cleared at once or left for future attention.

The effectual termination of dry-core cables is a difficult matter, as the entrance of moisture must be prevented, though the termination may be fully exposed to the weather. Fig. 3 shows a cable head designed by Mr. S. P. Grace, of Pittsburg, and made by the Western Electric Co. for external use. It consists of a cast-iron chamber with hinged cover, and contains a porcelain block, on which are mounted brass terminals with soldering tabs at the back. The cable sheath is plumbed to a brass nozzle, and the wires are

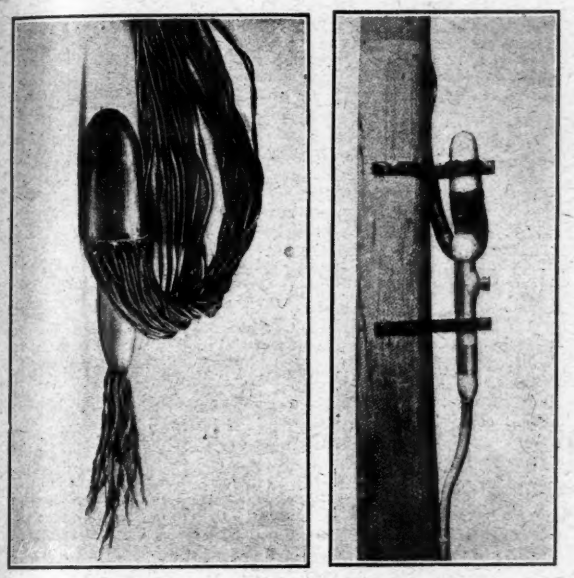


Fig. 4.—Pothead Complete, and as Mounted on Pole.

soldered to their respective tabs, after which the rear compartment is filled with molten compound through a hole at the top. The external connections are made with rubber-insulated wires.

Fig. 4 shows a pothead mounted on a pole; in this case the wires are jointed to V.I.R. insulated leaders enclosed in a lead sleeve, and impregnated with molten compound. The sleeve is finally plumbed to the cable sheath. Potheads are usually made locally; the leaders are cut to length and the outer tape and braiding are very carefully removed, after which the leaders are bunched and covered with a lead sleeve, which is beaten down upon them at the stripped end. Insulating compound is then run into the sleeve to seal the leaders, which are afterwards jointed to the dry-core cable in the usual manner. For use in exposed positions a lead cap is added, the leaders being doubled back and forced with the pothead sleeve into the cap, which contains molten compound. Fig. 4 shows a pothead of this type.

For indoor use, the cable is jointed to a special length of silk and cotton-insulated lead-covered cable, and the joint is filled solid with paraffin wax. The end of the special cable, which is to be connected to the terminal apparatus and permanently exposed, is stripped of its sheath and immediately well saturated with beeswax at a temperature of not less than 200° F. Afterwards the waxed wires are formed to suit the terminals.

All completed cables should be tested with dry air at a pressure of about 12 lb. per sq. in., with special pressure gauges; if after shutting off the air supply the pressure is maintained without appreciable drop for, say, 10 hours, it may be taken as proof that the sheath is air-tight.

The insulation resistance per mile of circuit should reach 500 megohms per mile, and when the dielectric consists of dry paper core only, without potheads, &c., much higher values should be attained. The insulation can be improved by forcing desiccated air at a pressure of 15 to 20 lb. per sq. in. through a lead-covered cable from end to end.

Discussion.

Mr. Dudley Stuart (National Telephone Co.) pointed out the great increase in the number of wires now contained in a cable of suitable size to be drawn into a 3-in. duct. A few years ago a 100-pr. cable was the largest size available, but it was now possible to draw a 600-pr. cable into a duct of this diameter. The policy adopted by the National Telephone Co. in the purchase of these cables was to give the manufacturers as free a hand as possible—electrical conditions always excepted—and to avoid tying them too closely to a specification. The result of this policy was to encourage enterprise on the manufacturers' part and to arrive at an improvement in the cables, such as a reduction of diameter. The National Telephone Co. had made a special study of the question of correct sheathing for dry-core lead-covered cable—lead or alloy—as there appeared to be some difference of opinion between various authorities, although the company had always made alloy sheath their standard practice. The speaker gave a summary of the results of investigations of lead as against an alloy of lead and 3 per cent. of tin; the deduction which he made was that the alloy offered the greater advantage. In pliability and facility of bending, lead was superior, but tensile strength was the only factor worth considering; and as for a given tensile strength alloy was cheaper, the National Telephone Co.'s practice could be readily understood. If the price of tin, however, went up to an abnormally high figure, it would be necessary to reconsider the question. Conductors of 70 lb. and upwards were provided on long circuits for transmission purposes. There had been a cable designed (not by the N.T. Co.) made up of conductors of equal weight, for which it was claimed that by combining a number of circuits the tranmission equivalent of heavier conductors could be obtained, but tests did not support the claims made.

The Author, in replying, agreed that the alloy sheath possessed advantages over the pure lead; tensile strength was an essential quality, as in hauling-in cables an appreciable strain was imposed on the lead. As regarded the Martin Dieselhorst cable which Mr. Stuart mentioned, he omitted to say that the conductors of heavier section than 40 lb. referred to were provided in cases where lines of higher transmission value were required.

Improvement of Power Factor in A.C. Systems.

On April 21st a discussion took place in the Institution of Electrical Engineers, Birmingham, on Mr. Miles Walker's paper (see Electrical Review, p. 237).

Dr. Sumpner said that none of the devices produced any improvement except on the generator side; they had no effect on the part of the system between the compensator and the load. This was an unfortunate fact. These machines could not be made on a large scale to compensate the whole system at once, and the commercial advantage would, in most cases, be comparatively small. The scheme suggested involved the use of a dynamo of the direct-current type, but with fields excited by an alternating current of low frequency, the object being to introduce into the rotor circuits currents of the right frequency and phase. The author had usefully pointed out that the magnetising current for the required compensation involved a number of volt-amperes proportional to the frequency of the current, and that hence low-frequency rotor circuits could be most economically used for the purpose. The whole question was one of cost.

Mr. A. M. Taylor pointed out that the compensator could not be separated from the induction motor, which was a slight disadvantage, as it was not always convenient to take a machine with a commutator into places where one could take a machine without a commutator. There might be other cases, such as where compensation was required for reactance drop in overhead lines or induction motor circuits, and where the supply authority did its own compensation in its own sub-stations, and in such a case he thought the author's machine would not be of any particular assistance; on the other hand, if consumers found the machine cheap and reliable, and easy to apply, and if they found that they obtained any pecuniary or electrical advantage by its use (such as steadier pressure), he quite thought that it had a future before it for such work.

Dr. G. Kapp considered that the author had taken the complicated method of Leblanc, and worked it out practically, but he was afraid that even now it was only practical as applied to very large motors. Such motors could be built with a power factor of about 96. It was doubtful whether the 4 per cent. was worth Leblanc's methods, but it was worth the arrangement of the author, which was much cheaper. He agreed that it was a commercial subject. It would be a great advantage if the author could get the apparatus fitted to small motors, and still more important if it could be attached to a single-phase motor. Leblanc having to start with two circuits at right angles, seemed to cut away hope that anyone would be able to adopt a system of that kind to a single-phase motor.

Dr. J. D. Coales (Birmingham University) suggested that the use of an open coil armature in the exciter would cause sparking.

Mr. Miles Walker, in replying, said that it was perhaps too early to speak about prices, although he could speak positively about results. It had been said that the compensators could only be used in conjunction with large motors; but if in a mill there was a large motor and a number of small motors, they could get a current from the large motor that would compensate for that taken by the small ones. The demand for the machine arose through the request of a big power-consuming company in the North of England that used a number of large induction motors, as to whether it was possible—almost at any cost—to make the motors run at unity power factor. It was essential that any improvement of the power factor must not be accompanied by sparking; and the machine must still require practically no attention. When this had been attained, he thought that there would be considerable use for it. As to the size of the commutators, the one they were building was for an 800-H.P. motor, and was about 9 in. in diameter. The mere fact that they had an open circuit armature did not mean that they would be troubled with sparking. It was possible with the compensator machine not only to bring the power factor to unity, but also to take a leading current, and in this way bring up the power factor of the whole system. He thought it would be possible to apply the method to a single-phase machine.

THE APPLICATION OF ELECTRICITY TO SUBMARINE SIGNALLING.

It has long been known that water is a better conductor of sound than air, but it is only in recent years that any serious attempt has been made to apply this knowledge to practical use.

The first experiments on record were made on Lake Geneva with a large bell, which, it was found, could be heard through the water up to a distance of 22 miles. The receiver, in this instance, consisted of a long tube terminating in a funnel-shaped orifice closed by a thin membrane. By immersing the funnel to the same depth as the bell, and applying the ear to the other end of the tube, every stroke of the bell could be distinctly heard.

The substitution of a microphone as a more convenient form of receiver was the next step in advance, and with this improvement submarine signalling gradually made its appearance as an aid to navigation. A large number of experiments were tried, both in France and America, with the result that submarine bells are now fitted to a number of lightships round the coast, and quite a fair proportion of ships are fitted with receivers.

Water possesses two great advantages over air as a conductor of sound, from the seaman's point of view. The first is the great distance to which sound can be propagated without any serious falling off in its intensity; the second is the greater homogeneity of water as compared to air.

It is well known that areas of silence often occur in air, and that a ship may be quite close to a fog-siren and hear nothing on one day, whereas at another time in the same place the siren will be heard loudly.

These areas of silence are not very well understood, but they do not appear to have any counterpart in water. Moreover, currents do not appear to exercise any appreciable effect; certainly they cannot be compared to the marked effects of wind.

It will thus be seen that there is every likelihood of submarine signals almost entirely superseding the older form of fog-signals for purposes of navigation. The expense of fitting microphones to a ship below the waterline and connecting them to telephone receivers is not great, and the cost of upkeep is practically nil.

The apparatus, as it is usually fitted, consists of a couple of telephone receivers placed in the pilot-house and connected to a change-over switch, whose function it is to put the pair of receivers in connection with either of two microphones placed respectively on the port and starboard side of the ship some few feet below the waterline.

By this means an approximate bearing of the source of sound can be obtained by noting on which side the signals can be heard, for only that microphone which is facing the direction from which the sound arrives will respond. Signals grow louder as the microphone faces more and more in the direction from which the sound is coming, and cease to be distinguished soon after the angle of incidence has reached a value of 45°. Thus a further advantage is gained over sound signals in air, which are often extremely difficult to locate.

The usual practice is to place the microphone in a tank filled with water, which is brought up to the required density by the addition of salts, and these tanks are bolted against the ship's side. The tanks are faced with india-rubber, so as to make a watertight joint against the side of the ship, which thus takes the place of one side of the tank. The sound waves coming through the water strike the exterior of the hull, and penetrating the ship's side enter the water in the tank and so reach the immersed microphone. It appears that the object in using tanks filled with water to suspend the microphone in, instead of attaching the microphone direct to the ship's side, is to secure freedom as far as possible from local noises. As a matter of fact though, this object is not very well attained.

In the experience of the writer, it is not very obvious that in actual practice there is much advantage to be gained by the use of tanks at all. If the ear be applied to the ship's side without any other receiving apparatus whatsoever, the signals may be heard just as distinctly, and the only advantage gained by the use of a microphone system would appear to be the convenience of carrying the sounds up to the pilot house by electrical transmission.

Experiments carried out with a microphone attached to a block of wood bolted on to the ship's side seemed to give equally good results.

When the ear is applied to the receiver, under ordinary circumstances there is a considerable amount of noise going on; the hull of the ship acts as a sort of sounding board, which collects and reproduces noises created in every conceivable manner by the work going on in the ship. The wash of the screw, clank and rattle of the main and auxiliary engines, rushing of water past the ship's side, and various other intermittent noises, combine to produce a babel of sound from which it would seem to be impossible to distinguish anything in the shape of signals.

Once, however, the sound of the distant bell has been recognised, the human element comes in, and the listener is able to pick out easily, and pay attention to, the particular sounds which represent the bell-signals. This, of course, is a matter of practical experience, and is by no means obvious until it is actually tried.

The sound of the bell is very much damped, and may be compared with that produced by striking a tin pot. The note is not sustained, and only the first few vibrations following on the stroke, which characterise it as the note of a bell, are heard. There is a great deal of secrecy maintained as to the details of the apparatus supplied by the enterprising company which has, in the face of considerable difficulty and prejudice, succeeded in pushing the system into practical use, but the writer's experience is that almost any form of microphone will suit the purpose so long as it is not too sensitive. What is, of course, most to be desired, is a microphone that will be selective and reinforce the particular note of the bell, while it remains more or less insensitive to local noises.

And now as to the bell itself. Though the deeper-toned bells are more powerful, their lower notes are not so distinctive in character as those of higher pitch. It is therefore necessary to strike a mean between the actual power of a note emitted and its capacity for being received.

The question naturally arises as to the necessity for using a bell at all, and whether some other method of producing sound under water might not offer an advantage. The answer is that, up to the present, attempts to improve on the bell have not met with any great success.

Attempts have been made to establish a system of signalling by means of the Morse code, and such a system of signalling would undoubtedly prove of immense value if it could be satisfactorily arranged. The difficulty lies in the unsuitable nature of bell-signals, such as are at present in use, in their application to the Morse code. If the signals are to be read entirely by the spacing, they become extremely slow, besides being a reversal of the common practice in sound signals. On the other hand, it is difficult to discriminate between longs and shorts with a bell that is so much damped. The bell is usually operated by compressed air, and the method of striking does not lend itself at all to the rapid transmission of the Morse code. The ideal sound-producer would appear to be some form of electrically-controlled siren designed to produce a sustained and definite note under water. Once this has been obtained, the difficulties of submarine signalling will have in a large measure disappeared.

It is the first blow on the bell that engages the attention; the rapidly damped vibrations following the stroke, and characterising its tone, simply play the part of informing the ear that the blow originated in the bell. What may be described as the "after ring" is only perceived as associated with the stroke, and is not good either in quality or volume. The attention once arrested and concentrated on a particular sound, the ear can follow a weak prolongation, and in this instance interprets it as being the note of a bell in contrast to all other noises. If, however, the bell received a rapid succession of blows, so rapid, in fact, as to produce a sustained note, not only would the sound be recognisable at a much greater distance, but the difficulty of creating longs and shorts in accordance with the Morse signal code would have been got over.

Before the Morse code was invented, any system of signalling, however laborious, would have been welcomed as an advance; now, however, telegraphists have exalted their code almost into a language, and if we wish to engage their attention in other than their established fields, we must talk to them in their own language as it at present exists. A code which can only claim to be an adaptation suited to the particular capabilities of a special apparatus is not likely to appeal to them with any force.

It is by comparison that most things are judged in this world, and until submarine signalling has reached a stage where it may be compared with other established methods of sound signals, it will not advance rapidly.

We have, it seems, reached a point where there is a direct call to electricity to step in and provide some form of sounder capable of producing in water a sustained note or distinctive noise analogous to that produced by the electric hooter or bell in air, before any really practical advance can be made with submarine signalling.

Working of Central Stations as a Business.—It was mentioned in this journal some time ago that the Berlin Electricity Works Co., which has a practical monopoly of electric lighting in the German capital, had made appropriate provision for the future employment of its funds in the event of the municipal authorities exercising their right of expropriation of the undertaking in the course of the next five or six years. The scheme took the form of the acquisition of the majority of the shares in the Electric Supply Co., of Berlin (Elektrisitäts Lieferungs Gesellschaft), whose business is the working of central stations, as well as being financially interested in other supply works. According to the supply company's report for 1908, the share capital was increased during the year from £500,000 to £750,000, and the obligations were also raised from £241,500 to £486,500, the augmentation in the latter case redeeming the credit granted by the Allgemeine Elektrizitäts Gesellschaft, which is associated with both of the companies in question. The supply company now carries on 28 central stations, the Furstenwald (Spree) works representing an addition during the year. The gross profits realised in 1908 amounted to £113,980, as compared with £96,140 in the preceding year, and the net profits were £70,040 and £62,970 in the same years respectively. It is proposed to pay a dividend at the rate of 10 per cent., being the same as in 1907, although the new share capital of £250,000 only participates to the extent of one-half for 1908. The works administered by the company are entered in the balance-sheet at £769,500, as contrasted with £665,500 in 1907, and the securities held and participations in other companies are valued at £320,500 and £323,000 in the two years respectively. It will be seen that the central stations worked by the company are of moderate cost on the average, which is just over £27,400

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

CRETE.—A duty of 11% *ad valorem* is levied on all goods imported into Crete, but if duty is paid down in cash a reduction of 10% of the amount to be paid is allowed. The value on which duty is calculated is the wholesale market price of the goods at the place of importation on the day of clearance.

CUBA.—It is imperative that the exact net and gross weights in kg. should be marked on each package and specified on invoices, bills of lading, and certificates of origin. The net weight of each class of goods should be stated and the origin of goods must be declared on all documents. The merchants' invoices in duplicate, in English or Spanish, the latter preferably, are to be written in ink (no flimsy copies), and must state the net and gross weight in kg. Merchandise must be technically described on invoices, and goods of compound manufacture should be fully specified. Invoices must state the names of shipper and consignee, the name and nationality of the steamer, the port of shipment, and the port of destination, the detailed price and total value including packing and expenses incurred up to shipment. If there are no expenses the f.o.b. value is to be given. There must be no writing on the back of invoices. A special declaration in Spanish is required to be made at the foot of each invoice below the total. Invoices must be signed by a member of the firm or by an agent duly authorised; if the latter, a letter of authority must be produced at the Consulate when invoices are presented. A Consular viss of invoices is required. For invoices not exceeding $50, no fee is charged; for invoices up to $200, $2 is charged, and an extra sum of 10 cents for each additional $100.

Dollar = 4s. 2d. Kg. = 2·204 lb.

The following duties are payable on electrical and similar goods:—

	Per 100 kg. Dollars.
Marble slabs, plates, &c., of any dimensions, polished or not	1·25
Petroleum or other mineral oils, rectified or refined, for illumination or lubrication	4·375
Benzine, gasolene and mineral oils not specially mentioned	5·875
Electric insulators of glass	1·30
Incandescent electric lamps, mounted or not	3·25 per 100
	Per 100 kg.
Articles of fire-clay	·39
Conduits of clay, glazed or unglazed, cement or stoneware	·325
Cast-iron articles, neither polished nor turned:	
Bars, beams, plates, columns and pipes	·65
Lubricating boxes for railway stock and railway chairs	·455
Other articles	·975
Cast-iron articles, polished or turned	1·56
" " tinned, or coated with other metals or porcelain	2·99
Wrought-iron or steel, rolled:	
Rails	·65
Bars of all kinds	1·17
" fine crucible steel	2·08
Wrought-iron or steel:	
Cast in pieces in the rough, weighing each:	
25 kg. or more	1·30
Less than 25 kg.	1·755
Wrought-iron or steel:	
Wheels weighing more than 100 kg., fish-plates, chairs, sleepers, springs, &c.	·78
Wheels weighing 100 kg. or less	1·92
Wire, galvanised or not:	
2 mm. or more in diameter	1·30
More than ½ mm. and up to 2 mm.	1·69
½ mm. or less in diameter, and wire-covered with any kind of tissue	2·08
Wrought-iron in large pieces for bridges, &c.	2·34
Tools and implements (not apparatus):	
Fine, for arts, trades, and professions, of crucible steel	10·40
Other	3·25
Manufactures of tin plate	5·20
Wrought-iron or steel articles of all kinds not specially mentioned in the Tariff, common even if coated with lead, tin or zinc, or painted or varnished	3·90
Wrought-iron or steel articles of all kinds not specially mentioned in the Tariff, fine	5·20
Copper, or alloys of copper, in bars	5·625
" " " in sheets	6·25
Wire, galvanised or not:	
1 mm. or more in diameter	7·50
Less than 1 mm. in diameter	9·375
Gilt, silvered or nickeled	62·50
Wire covered with tissues or insulating materials for the transmission of electricity:	
Wires and cables not protected	9·325
The same protected by lead tubes and other insulating covers	2·50
Articles of copper not specially mentioned in the Tariff, varnished or not	25·00
Carbons, prepared for electric lighting	3·90
Steam motors (stationary), steam pumps, hydraulic, petroleum, gas, and hot or compressed air motors, boilers, locomotives, machines of copper and its alloys, and dynamo-electric machines and parts	25% ad val.
Railway and tramway carriages of all kinds	31¼% ad val.
Caoutchouc and gutta-percha manufactured in any shape or into any kind of article not elsewhere mentioned in the Tariff, per 100 kg.	26 dols.
Goods not specially mentioned in the Tariff, except crude materials	32½% ad val.
Crude materials, not specially mentioned in the Tariff	13% ad val.

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

10,974. "Improvements in electric switches and combined switches and fuses." W. L. Barber. May 10th.

10,998. "Improvements in terminals for electrical wiring." G. C. Braid, W. Omerod and J. Phillips. May 10th.

11,006. "Improved device, chiefly designed for use as an electric switch, but also applicable for producing motions for various purposes." W. H. Smith. May 10th.

11,060. "Improvements in and apparatus for the production and maintenance of long electric arc." G. W. Johnson. (Chemische Fabrik Griesheim-Elektron, Germany.) May 10th.

11,107. "Improvements relating to portable current generators actuated by movement of the body." J. P. Dyer. May 11th.

11,116. "Improvements relating to protective coverings for ships' propeller shafts and other machine parts, said coverings being also adapted to serve for analogous purposes, such as the lining of cells for electric accumulators and of rooms for containing electric accumulators." H. O. Traun. May 11th. (Complete.)

11,135. "Improvements in or relating to the insulating of electric cables." British Insulated and Helsby Cables, Ltd., F. A. Cole and J. Shaw. May 11th.

11,149. "Improvements relating to supports for electric lamp filaments." Soc. Francaise d'Incandescence par le Gaz (Systeme Auer). (Date applied for under Sec. 91 of the Act, July 13th, 1907, being date of application in France; an invention comprised in Application No. 12,720, dated June 18th, 1908.) May 11th. (Complete.)

11,154. "Improvements in batteries and battery holders." G. L. Patterson. (Date applied for under Sec. 91 of the Act, May 26th, 1908, being date of application in United States.) May 11th. (Complete.)

11,155. "Improvements in batteries." G. L. Patterson and G. H. Hopper. (Date applied for under Sec. 91 of the Act, October 16th, 1908, being date of application in United States.) May 11th. (Complete.)

11,169. "Improvements in magnetic ignition apparatus." R. J. Isaacson. May 11th.

11,172. "Improvements in and relating to electric heating devices." British Thomson-Houston Co. (General Electric Co., United States.) May 11th.

11,201. "Improved process of and apparatus for use in distributing electricity." E. W. Lucas and W. Walmsley. May 12th.

11,209. "Improved splicing ear for electricity conductors." J. C. Russell and A. F. Lord. (Date applied for under Sec. 91 of the Act, October 31st, 1908, being date of application in New Zealand.) May 12th. (Complete.)

11,210. "Improved section insulator for electric tramways." J. C. Russell and A. F. Lord. (Date applied for under Sec. 91 of the Act, November 2nd, 1908, being date of application in New Zealand.) May 12th. (Complete.)

11,228. "Improvements relating to electric ignition apparatus for internal combustion engines." R. F. Hall. May 12th. (Complete.)

11,242. "Improvements in and relating to master switches for radio-telegraph and radio-telephone stations." A. W. Sharman. May 12th.

11,266. "Reflecting mirror covering interior of base or cap of electric bulbs and lamps." G. Madden. May 12th.

11,267. "Improvements in connecting terminals for switchboards." H. Brand. May 12th. (Complete.)

11,269. "Improvements in mechanical power-producing motors." F. Major. May 12th.

11,282. "Improvements in and relating to electric arc lamps." E. R. Grote. May 12th.

11,285. "Improvements in and relating to electric distribution systems." British Thomson-Houston Co., Ltd. May 12th.

11,302. "Improvements in or relating to electric controllers for railway service and the like." T. von Zweigbergk. May 12th. (Complete.)

11,303. "Improvements in or relating to electric controllers." T. von Zweigbergk. May 12th. (Complete.)

11,304. "Improvements in or relating to the protection of high-tension direct-current motors in series." T. von Zweigbergk. May 12th.

11,317. "Improvements in electric furnaces." W. O. Rooper and J. B. Belcher. May 13th.

11,326. "Trolley retriever for electric cars." J. Eccles and W. E. Hadfield. May 13th.

11,338. "Electrical device for transmitting angular movements to a distance." F. Spalazzi. (Date applied for under Rule 13, May 30th, 1908. An invention comprised in application No. 11,810, dated May 30th, 1908.) May 13th. (Complete.)

11,339. "Improvements in and relating to power transmission systems." Allgemeine Elektricitats Gesellschaft. (Date applied for under Sec. 91 of the Act, May 13th, 1908, being date of application in Germany.) May 13th. (Complete.)

11,346. "Improvements in or relating to electrically operated fountains." A. D. Southam. May 13th.

11,400. "Improvements in and relating to power transmission systems." Allgemeine Elektricitats-Ges. (Date applied for under Sec. 91 of the Act, May 13th, 1908, being date of application in Germany. Application for Patent of Addition to No. 11,339 of 1909.) May 13th. (Complete.)

11,402. "Improvements in or relating to prepayment electricity meters." W. N. Goddard. May 14th.

11,413. "Improvements in electric current distribution." J. Pinson. May 14th.

11,417. "Improved form of secondary or storage battery or accumulator for electric current." W. J. Fifield and H. A. Morris. May 14th.

11,445. "Improvements relating to the control of electric motors." A. T. Dawson and A. P. Pyne. May 14th.

11,460. "Improvements in the electric staff or tablet system of controlling railway traffic." A. T. Blackall and C. M. Jacobs. May 14th.

11,480. "Improvements in electric induction furnaces." A. Hiorth and C. W. Soderberg. (Date applied for under Sec. 91 of the Act, May 16th, 1908, being date of application in Norway.) May 14th. (Complete.)

11,482. "Improvements in electric arc lamps." W. J. Davy. May 14th.

11,497. "Device for automatically connecting up the subscribers of a telephone exchange." J. Peticky, F. Suchanek and I. Cizek. (Application for Patent of Addition to No. 28,036/1904.) May 14th. (Complete.)

11,540. "Improvements in and in connection with ploughs for electric tramcars." G. L. Walker and J. T. Niblett. May 15th.

11,544. "Improvements in apparatus for wireless telegraphy." Marconi's Wireless Telegraph Co., Ltd., and H. J. Round. May 15th.

11,559. "Improvements in or relating to electrical contacts." A. J. Postans. May 15th.

EXPIRING PATENTS.

(*Continued from page 868.*)

6,048. March 23rd, 1895. "Insulating sheets." C. Bolle. (C. W. Jefferson.)—Sheets of flexible insulating material are formed by arranging alternating layers of mica scales and gutta-percha tissue with or without alternations of textile material and gutta-percha. Asbestos fabric may be used with the mica, or a sheet may be built up of asbestos fabric with gutta-percha tissue and facings of paper, &c.

6,864. April 3rd, 1895. "Controlling traffic on railways." G. K. Winter and G. B. Arkonam.—Relates to controlling the issue of "line clear" tickets, so that a ticket cannot be issued unless the "line clear" signal, followed by a prolonged current in the same direction, is received, and so that the slide withdrawing the ticket cannot be replaced until the "arrival" signal followed by a prolonged current is received. To enable a "line clear" signal to be cancelled, a special key is provided; by operating this key, while a prolonged current is being sent from the distant station, the handle is unlocked so that it can be returned to the "off" position. The ticket drawer is interlocked with the semaphore. The handle is made to operate mechanism which registers the number of times it is operated, and it also operates a visible indicator showing the state of the line as to trains approaching the station. The drawer operates a similar indicator, showing the state of the line as to trains leaving the station.

7,458. April 11th, 1895. "Electrolysis." C. Kellner.—Relates to electrolytic apparatus, in which mercury cathodes are employed, arranged with the decomposing cells either in series or parallel. A series of these cells are connected up to a dynamo. The amalgam formed in these cells is led off by pipes to forming cells wherein the amalgam is decomposed. The forming cells are connected electrically in series, and may act as a battery for doing external work.

7,782. April 18th, 1895. "Electric resistances." J. F. H. Voigt and J. A. Haeffner.—Metal, such as gold, silver, platinum, &c., in a finely divided condition, is applied to porcelain, glass, talc, or other suitable insulating material. The metal may be applied directly; by applying in the form of liquid gold, &c., and then firing; by precipitating from solutions; or by the decomposition of metallic carbon oxides, as described in specification No. 21,025 A.D. 1890. The metallic layer so obtained may be strengthened by electrolytic deposits, which are then burnt on.

7,990. April 22nd, 1895. "Printing telegraphs." F. H. W. Higgins.—Relates to telegraphs arranged so that the message is transmitted from type set in a travelling carriage by means of a number of contacts which cover the full width of the type and are held in position by springs. The message is recorded by a number of magnets corresponding to the contacts, &c., whose armatures carry rollers which constantly run on an inking roller.

8,385. April 27th, 1895. "Dynamo-electric machines." A. B. Soar and E. W. Collier.—A brush is made up of a number of superimposed layers of corrugated wire fabric consolidated by pressure. The corrugations run the length of the brush.

8,392. April 27th, 1895. "Electric lighting." M. Moskowitz, L. D. Adler, A. S. Adler and T. W. Myers. Relates to the electric lighting of railway vehicles by means of accumulators charged by a dynamo driven from the axle of the car. The dynamo is shunt-wound, having a variable regulating resistance in the shunt circuit, which automatically keeps the pressure on the mains constant in spite of fluctuations in the speed of the dynamo. A switch closes the charging circuit when the pressure at the dynamo terminals is sufficiently great. There are two sets of accumulators, one of which is used for lighting while the other is being charged.

8,393. April 27th, 1895. "Electric lighting." M. Moskowitz, L. D. Adler, A. S. Adler and T. W. Myers.—Relates to systems of electrically lighting railway vehicles in which the dynamo is mounted upon the axle of the car. The dynamo has two or more armatures connected in series, which are mounted upon a tube secured upon the car axle. The field magnets are on the outside of the frame sections, and the said sections are supported by powerful springs attached to the timbers of the truck. The field magnets are differentially wound to give constant potential at the brushes independent of the speed; each half of the machine having its own shunt magnetising coil, and the two armatures being coupled up in series with the series coils on all the field magnets.

8,394. April 27th, 1895. "Electric lighting." M. Moskowitz, L. D. Adler, A. S. Adler and T. W. Myers.—Relates to a method of regulating dynamos running at variable speeds, so as to give constant pressure on the mains. The generator supplying the lamps has its fields separately excited by current from the subsidiary series dynamo, this latter machine being coupled on the same shaft with a shunt motor which is driven direct from the mains. The dynamo is differentially wound, having coils in shunt with the mains. A shunt coil on the generator serves to excite it sufficiently to start the motor. The regulating dynamo serves to keep the pressure on the mains constant, as an increase of speed of the generator produces an increased current in the coils and a diminished current in the exciting coils, which brings down the electromotive force of the generator to the normal.

8,573. April 30th, 1895. "Electric conductors." W. S. Smith and W. P. Granville.—Conductors are fixed near the inner surfaces of crescent or equivalent-shaped strips of gutta-percha. These strips are formed into a tube, and are covered with further layers of gutta-percha. The strips may be twisted to form helices, and two conductors may be set in each strip. A central airspace is left along the cable to reduce induction.

8,728. May 2nd, 1895. "Galvanic batteries." J. G. A. Rhodin.—Secondary batteries. An electrode is made by inserting in holes in a frame-plate plugs of lead sheets or strips, formed with ridges connected by thin films of the metal and then rolled up. After use, the connecting films disappear and the plug becomes practically a bundle of lead wires.

9,167. May 8th, 1895. "Cable telegraphy." J. A. L. Dearlove.—Automatic telegraph systems are arranged so that the message is transmitted along the landline by means of an automatic transmitter—preferably such as described in Specification No. 20,807, A.D. 1894—and is received at the terminal station of the landline by an apparatus which records the message as a perforated strip similar to the original and capable of use in a similar automatic transmitter for signalling along the cable.

11,482. June 12th, 1895. "Submarine telegraphy." H. A. Taylor and J. A. L. Dearlove.—Repeating mechanism for submarine working is described as used with the transmitter described in Specification 20,807 of 1894. The first section of the line ends at the receiving station in a double polarised relay, or two separate relays. The armatures of these relays put one or other pole of a battery to line, the other pole being put to earth. The line leads to a contact near the oscillating lever connected to the second section of the line. The lever is oscillated synchronously with the transmitting apparatus by links connected to levers operated by cams on a shaft driven by clockwork or motor. In a modified arrangement, the synchronous movement is omitted, and a clutch, such as is described in Specification 9,767 of 1895, is operated by a relay to control the motion of an oscillating contact lever.

11,548. June 13th, 1895. "Telephone system." J. E. Kingsbury. (Western Electric Co.)—Telephone systems are arranged with lamps to act as call or indicating devices. Batteries and impedance coils are arranged in each circuit beyond the jack connections, and the lamp at the exchange is normally kept just below illuminating point, so that when the subscriber takes his receiver off the hook, the local battery is put to line and causes the lamp to light up. In a modified arrangement, the whole of the illuminating power is at the central station, and the lamps are set beyond the plug connections.

11,549. June 13th, 1895. "Telephone system." J. E. Kingsbury. (Western Electric Co.)—Telephone systems are described in which electric incandescent lamps are used as the indicators or calling devices. Several arrangements of the circuits are described for the line and clearing-out lamps, in which the line lamp glows until the plug is inserted, when a shunt is formed which causes its relay to break circuit. The clearing-out lamp or lamps only glow when both subscribers hang up their telephones. The lamps may be set in cases having plug contacts, which engage between springs placed inside sockets, and a lens of opal glass may be placed in front of the lamp to diffuse the light. The sockets may be arranged in grooved bars, the grooves enabling a barbed fork to be used for removing a damaged lamp.

12,229. June 24th, 1895. "Electric resistances." H. J. F. Voigt, and J. A. Haeffner.—Consists in making resistances by coating an insulating material, such as porcelain, glass, talc, &c., with metal in a finely divided condition. The metallic layer may be strengthened by electrolytic deposits, subsequently burnt on.

13,380. July 11th, 1895. "Electric distribution." M. Moskowitz, L. D. Adler, A. S. Adler and T. W. Myers.—Relates to the lighting of railway vehicles or other purposes, in which the generator is driven by a variable power. The field magnets of the self-exciting generator are specially wound to keep the voltage constant in spite of varying speed. One form of automatic switch is described.

13,496. July 18th, 1895. "Ordnance." L. Obry.—Relates to an apparatus for discharging guns on board ship by means of external breech mechanism. A gyroscope, rotated by an electromotor, is arranged to close the electric firing circuits of the guns at the instant that one or both of the main axes of the ship are in a horizontal position.

14,627. August 1st, 1895. "Electric fire alarms." A. C. Brown and G. R. Neilson.—In order that a call shall produce at the receiving station a sound distinguishable from that produced by contacts or other faults, the calling apparatus comprises a rapid make-and-break, which is operated electrically when the glass is broken, &c., and produces an intermittent current which actuates a telephone, &c., at the receiving station.

(To be continued.)

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1908.

Galvanic Gas Batteries. E. W. Jungner. 5,214. March 7th.

Galvanic Gas Elements. E. W. Jungner. 5,228. March 7th.

Swing-Out Electric Lamp Carriers. T. L. Scott. 5,719. March 14th.

Apparatus for Restricting the Maximum Current Passing in Electric Circuits. W. Fennell and W. D. Perry. 7,644. April 7th.

Electric Meters. W. Fennell and W. D. Perry. 7,645. April 7th.

Electrical Heating. E. C. R. Marks. (J. Roberts, Natal.) 8,093. April 11th.

Electrical Apparatus for Use in Receiving and Transmitting Impulses which may be Used for Gun-fire Control. H. J. Greffield. 8,346. April 15th.

Alternating Electric Current Distribution Systems. J. S. Peck. 8,377. April 15th.

System of Mounting Electrically-Driven Punkahs. A. Bergtheil. 8,543. April 16th.

Sparking Plugs for Internal-Combustion Engines. F. J. Watt. 9,020. April 25th.

Electric Furnaces for the Manufacture of Steel. A. Hugot. 12,258. June 5th.

Variable Motion Gear for Actuating Magnetos, Dynamos and the like for Electric Ignition and Similar Purposes. E. E. Brown. 12,527. June 11th.

Portable Electric Lamps. London Import Co. and B. Pordes. 12,654. June 12th.

Instrument for Detecting Electric Oscillations. J. A. Fleming. 13,518. June 25th. (Cognate Application 26,832/08.)

Electric Motor Starters. G. C. Fricker. 15,013. July 15th.

Preventing Accidents to Life and Property Caused by the Falling of Aerial Wires Carrying High-Tension Electrical Currents. D. P. F. Ghadiali. 16,415. August 4th.

Electrical Accumulators. P. L. Trin. 17,638. August 20th. (Date applied for under International Convention, August 29th, 1907.)

Primary Electric Cells or Batteries. A. Heil. 24,008. November 9th.

Inductor Magneto Alternators. L. J. le Pontois. 26,170. December 3rd. (Date applied for under International Convention, July 11th, 1908.)

Apparatus for Measuring Electromagnetic Wave Lengths. Marconi's Wireless Telegraph Co. and H. J. Round. 26,588. December 8th.

26,832. See 13,518 of 1908 (above).

Arc Lamps. A. Holman. 27,536. December 18th.

1909.

Telephone Mouthpieces. H. W. Lake. (Gibson Manufacturing Co., United States.) 5,705. March 9th.

Cooling of Enclosed Dynamo-Electric Machinery. Akt.-Ges. Brown, Boveri et Cie. 7,203. March 25th. (Date applied for under International Convention, March 30th, 1908.)